

## INTRODUCTION TO THE MOLLUSCA.

pp. 1-24 - 1848; pp. 25-44, 1850, pp. 45-88, 1852

THE portions of the bed of the ocean subject to examination during the Voyage of H.M.S. Samarang comprised the coasts of that portion of the volcanic zone of islands termed the Banda Group, including Java, Timor, Ternate, &c., from thence to the great chain commencing with Gillolo, Borneo, and Celebes, northwards through the Philippine Islands and Bashee Group to the north-east, through the Loo-Choo Archipelago, the Meiacoshima Islands, and Corean Archipelago, as far as Japan; and homeward across the Indian Ocean, visiting the lagoon islands of Keeling, the great barrier reef and islets of St. Brandon, the Mauritius, and the Agulhas Bank, to the Cape of Good Hope.

In the Straits of Sunda an opportunity was afforded of examining for the first time the animal of *Phorus*, six out of seven species of which are natives of these seas. Passing through the Straits of Gaspar, the soundings varied from sixteen to twenty fathoms, the floor being soft mud: the Mollusca obtained were species of *Clavatula*, *Pleurotoma*, *Phos*, *Ringicula*, *Ovulum*, and *Erato*. In that portion of the China Sea which lies between the extremity of the peninsula of Malacca and the island of Borneo, we obtained *Crassatella radiata*, *Cancellaria antiquata*, *Corbula tunicata* and *crassa*, several species of *Cylichna*, *Ringicula*, *Nucula*, *Pleurotoma*, *Marginella tricineta*, and single valves of the *Cardilia semi-sulcata*, besides *Phorus Indicus* and *Solarioides*, *Terebellum subulatum*, and *Rostellaria fissa*. The China Sea, forming one of the narrow gulfs or divisions of the great Pacific Ocean, enclosed by Borneo, the Philippines, and Formosa, seems to resemble a shallow basin, the floor of which is formed of mud, gravel, and the debris of dead shells; and although probably the sediment of the numerous large rivers, which carry down mud, sand, and gravel, would

not raise its bed in any considerable degree for ages, yet the Meinam and Camboja rivers, subject to inundations which loosen the earth of their banks, must continually alter the nature of the floor. The Hoang Ho, or Yellow River, alone daily contributes forty-eight millions of cubic feet of earth, which may partly contribute to the turbid appearance of its waters, and cause an uneven surface, inhabited chiefly by mollusks whose progression is rather a succession of jumps than a gliding motion. The gradual accumulation of alluvial matter must destroy large numbers of molluscous animals that live buried or at the surface of the mud, and as successive generations take their place above them, which in turn suffer the same fate, vast beds of accumulated shells will be formed like those among which our dredging operations were conducted, which in process of time will fill up the estuaries and increase the dimensions of the continent. Many new species were procured by placing the produce of the dredge in large wire sieves, washing it clean by pouring water on it, and picking out the small shells with forceps: in this manner several beautiful *Triphoris*, *Scaligeria*, and *Liotia* were obtained. In the Sooloo Islands the water is very deep outside the barrier reefs, the bottom is for the most part muddy, and the tide runs between the islands at the rate of four miles and a half per hour; the *Phos roseatus*, *reteosus*, *Blainvillii*, and *sentiosus* were abundant, the caudal extremity of the animals of all the species ending in a slender filament. *Terebræ*, *Mitræ*, *Pectunculi*, *Carditæ*, and *Conus thalassiarehus* were obtained. Crossing from Sooloo, we proceeded along the east coast of Borneo, and anchored for about twelve days outside a sand-bank about a mile and a half from the easternmost point of the province of Unsang. This part of the coast of Borneo is very flat, the bottom within the fringing reefs is sand and broken coral: numerous species of *Cypræa*, *Rotella*, and *Oliva* were obtained here; and in the large swampy lagoons and rivulets of brackish water slender *Melania*, *Assimineæ*, and *Neritinæ* were collected. Within Cape Rivers, at the north-western extremity of Celebes, a belt of coral extends from the extreme outer islet to the southward for about a mile and a half, where it joins the main and forms a snug harbour, with about eight fathoms in the bight. As there is a rise of tide of about nine feet, many parts of these reefs are left bare at low water, and abound in Mollusca. In many places the dark and slug-like bodies of *Parmophori*, and the crawling forms of the *Stomatellidæ*, especially those named by Mr. J. E. Gray *Gena*, which cover a portion of their shells with the foot, were seen gliding about the coral beds; while scarce a stone was turned without disturbing

*Chitonelli*, which slide rapidly away or conceal themselves in holes. In every part where solid rock was seen the bright blue gills of the *Tridacna* were visible in the fissures, while *Nerita* and *Patella* covered the stones along the shore. As soon as the tide rose and bathed the rocks, *Coniæ* and *Balani* that encrust them exhibited a strange appearance, millions of branchiated feet being then extruded from the apertures of their shells, all vibrating at once in a regular measured manner, and forming little vortices around them; various Gastropods, now beginning to feel the water welling up around them, would be seen to dilate their locomotive discs, exert their siphons, and cautiously forsake the holes and crevices where they had lain concealed; while on the sandy patches the siphons of the *Solen* and the *Maetra* were protruded from innumerable holes, stirring the soil with their beautiful fimbriated extremities. At Manado, another part of the coast of Celebes, the coast line is very different, and seems to consist of the side of a volcanic mountain, the anchorage, at the distance of a mile from the shore, being in 150 fathoms, with a floor composed of iron-stone sand. In the fresh-water ponds and rivulets *Aurricula subulata* and *Conovulus leucodon* were found upon the moist banks in company with species of *Assimineæ*, and on the mud-flats of the river, during the reflux of the tide, myriads of *Clithon*, *Neritina*, and *Melaniæ* were observed; while *Pirena* were numerous in the bed of the river, where the water was deeper. The *Neritina sulcata* was found on the foliage of tall trees, many hundred yards from the river. *Neritina* and *Navicella* were obtained from floating sticks, and from the petioles and roots of the Nipah palm; while *Ampullariæ* were not uncommon in the still ponds, many being observed on the stones out of the water. The shores of the volcanic island of Gillolo, and others of the Molucca Archipelago, with arms separated by narrow channels of the sea, surrounded by barrier reefs and coral fringes, abound with molluscous animals. On some of the shallow shores, especially where there were no currents, the water was appreciably warm, averaging about 84° Fahr., whereas throughout the ocean generally it is usually about 39° Fahr. Among these islands, as elsewhere, we found herbivorous mollusca, that feed upon the *Algæ* and *Fuci* covering the rocks and stones:—*Purpura*, *Littorina*, and *Nerita* on exposed rocks, *Chiton* and *Doris*, *Patella*, *Siphonaria*, and *Vermetus* adhering to the stones, with *Mytilus*, *Ostræa*, and *Byssosarca* anchored in the clefts. A little further out, the *Naticæ* and *Olives*, partly covered by their foot, form burrows in the sand in company with *Nassa* and *Pyramidella*, while *Venus*, *Solen*, and the

light-shelled *Mactra* perforate obliquely the yielding soil. On the reef *Cowries* and *Stomatella* abound; outside the barrier *Marginella*, *Fusus*, *Pleurotoma*, *Clavatula*, and *Strombus*; while in the deep water, more seaward, *Terebratula*, *Cylichna*, *Nucula*, and *Neera* are met with. At Leegeetan, in Borneo, there are many miles of low mangrove-swamp, partly watered by trickling rivulets, where thousands of *Telescopium* and *Potomis*, or *Cerithium palustre*, are seen partially buried in the mud, their spires bristling the surface; amongst the tangled mangrove-roots were numerous *Cassidula* and *Quoyia*; in the half-stagnant ponds *Melania* were abundant, and, crawling on the soft muddy banks, forming slender tracks, were *Nematuro* and *Assimineia*; in the damp woods near, *Auricula Midæ*, *Scarabi*, and *Pedipes* were obtained; *Pterocyclos parvus*, *spiraculum*, and *spiracellum*, and *Cyclostoma planorbulum* were found among decayed leaves, in the fissures of rocks near the margin of the forest, while *Choanopoma concinnum* and *nitidum* were seen inhabiting the foliage of the trees; *Scarabi* were very numerous, usually hiding under dead leaves, but crawling about briskly after rain. The number of herbivorous mollusca peculiar to Borneo, judging from our limited exploration, does not seem so great as we might be led to expect from its abundant vegetation and warm, humid atmosphere; the large *Helix Brookei* and the *Bulimus Adamsii*, together with *Nanina vittata* and some others, were, however, obtained from this island.

From the circumstance of the islands of the Eastern Archipelago lying within the tropics, the equinoctial line extending nearly through the centre, the Mollusca partake of characters exhibiting general uniformity; but when one group is separated from the rest, as the Philippine by the seas of Sooloo and Celebes, several peculiarities occur in their distribution. The genera *Stomatia*, *Gena*, *Stomatella*, *Mitra*, *Mangelia*, and *Liotia* appear principally confined to this group. Whether it is owing to the laborious and successful efforts of the Prince of Collectors, Hugh Cuming, Esq., which have made the Mollusca of these islands known, or whether to natural causes, it is certain these islands harbour a vast number of forms. The constant flow of water towards these equinoctial regions may tend to favour the submarine migration of Mollusca thither, added to which, the vast stores of nutriment and the higher degree of temperature of the water, favour their growth and reproduction. Upwards of fourteen species of *Cyclostrema*, as many of *Liotia*, whose habitats are known, have been collected among the Philippine Islands; while sixteen

species of *Stomatella*, nine of *Stomatia*, sixteen of *Gena*, and a small new genus belonging to the same group, were also procured by Mr. Cuming from the same locality, appearing to represent the *Haliotis* family of Australia and the *Chitonidæ* of America. The members of this group are tolerably brisk in their movements, crawling among the stones and coral at high water, and hiding under stones during the reflux of the tide; they have the power of spontaneously throwing off the hind part of the foot when taken, in the same manner as the *Ophiurus* parts with a ray, or a Crustacean a claw. Out of forty-seven species of *Mangelia* described by Mr. Lovell Reeve in his beautiful monograph of that genus, no less than forty-three are from these islands; their favourite locality is coarse loose sand, either sand-patches on the reefs, or under stones in deeper water outside the reefs, or in still deeper water where the sand is mixed with mud. The species which live at considerable depths, as *M. abyssicola*, *cinnamomea*, and *tenebrosa*, are dark-coloured and strongly ribbed; those that prefer the loose sands are generally granulated, finely ribbed or cancellated, and of a light brown colour; while light-coloured species, as *M. Marginelloides*, which are seen crawling over mud-flats, are often covered with a fuscous epidermis. Perhaps the amount of colour in shells depends upon the degree of light they are subject to: as light does not penetrate lower than 700 feet, Mollusca dredged from very deep water are usually colourless, while species living on the rocks are usually brightly coloured. On turning large stones, groups of *Ricinula Columbelloides*, *Rissoæ*, and other gregarious genera, as *Truncatellæ* and *Melampii*, which are amphibious, were constantly met with, and during the night *Neritæ* were observed crawling actively in company over the stones; and in the pools within the barrier reefs, numbers of *Limæ* were observed darting rapidly about. In the Samboanga Roads very few shells were obtained, as the tide sets through them with great rapidity, and no soundings can be obtained further off shore than half a mile, where the floor is composed of dead coral, black sandy mud, and loose pebbles; a coral reef, however, borders the shore all along this part of Mindanao, within which the water is comparatively shallow and filled with marine vegetation supporting numerous *Fissurellæ* and *Emarginulæ*. In fresh-water ponds and rivulets near the village of Calderas, *Navicellæ*, *Melaniæ*, and *Neritinæ* were very numerous; but no *Ancylî*, *Ampullariæ*, or Bivalves could be detected. The *Bulimus chloris* was very abundant on the mountains: it glues itself to the under surface of leaves; the eggs are very large, oval, calcareous, and of the same size at each end, and the young shell, which

occupies the entire cavity before extrusion, is perfectly pellucid. In the woods of Ambolan and other small islands at the east end of Mindoro, although the pulmoniferous Gastropods were in a state of æstivation, specimens of *Caracolla* (*Listeri* and *rota*) were obtained from under loose bark; *Helicina polita*, *Bulinus fetilis* and *sylvanus*, adhering to the branches; *Chondropoma atricapillum* and *læve* attached to the under surface of the leaves; *Megalomastoma alatum*, *Pupina Mindorensis*, *similis*, and *lubrica* hiding in clusters amid the holes and fissures of the banks; and species of *Cyclostoma* proper, concealed under loose stones and dead leaves, at the foot of the trees. While slowly sailing through the calm and beautiful sea of Mindoro, the young of two species of *Dolium* occurred in light brown patches, mixed with floating *Algae*, among which were also species of pelagic *Aplysiadæ* and several Nudibranchs, which seem to browse on these pygmy forests like caterpillars on the trees, clinging by their long grooved foot to the stems of the *Fuci*, and relieving by their gaudily-coloured bodies the monotony of the submarine scenery.

The Batani Islands, or Bashees, a volcanic group, which forms a link of the great chain connecting the Philippines and Formosa, and which is continued by means of isolated craters to the Loo-Choo and Japanese Archipelagoes, exhibits rather a barren field to the labours of the malacologist. Originally torn from the Philippine chain, they still bear traces of their plutonic origin in the shape of old exhausted volcanoes and magnetic iron-stone. On the sheltered side of Ibujos, however, extensive reefs afford good retreats for mollusca; but the strong tides and black shifting sand render the other shores very unproductive. The inland parts, however, harbour numbers of the beautiful *Helix speciosa* and three varieties of *Bulinus Kochii*, together with a new sinistral snail, our *Helix Batanica*. There appears to be a sandy belt between China and the Bashee group, for on the coast, about forty miles from the north-east point of Hong-Kong, soundings were obtained in thirty-four fathoms, fine sand; this extends as far as the Pratas shoals, and between the latter and the Bashee Islands. *Clavatula robusta* and other species, *Murex pinnatus*, *Isocardia Moltkiana* and *vulgaris*, and a small species of *Scalaria*, were dredged here. From the North Bashees to Sama-Sana the full force of the N.E.E. current is felt, the nearer Formosa the stronger, but north of this it perceptibly diminishes; hence, northern species of marine mollusca would be more probably met with as you approach the islands of the Eastern Seas, than southern species among the Korean Archipelago; the currents, moreover, isolating the islands from

the main land, may possibly assist in determining a peculiar Fauna, but as we did not visit the opposite shores of Asia, we were unable to judge from personal observation if such is the case; near Botel Tobago sounding could not be obtained with 150 fathoms of line. The Meiacoshima group, though never forming Attolls, abounds in barrier reefs and coral fringes, which sometimes extend from a half to three-quarters of a mile from the shore. *Fissurellæ* abound within the reefs, where the vegetation is abundant, and where, together with *Emarginulæ*, they crawl among the branches of the arborescent *Algæ*. The flats and plains covered with coral, forming extensive shoals among these islands, are frequently dry at low water, where *Mitra exasperata* and *arenosa*, with *Turbo*, *Ricinula*, *Conus*, *Cypræa*, *Lima*, *Pecten*, *Terebra*, *Pteroceras*, &c., occur in tolerable abundance.

The superficial temperature gradually diminishes from the tropical seas towards the southern hemisphere; hence we find the forms of molluscous animals growing less numerous and of less brilliancy of colouring as we recede from the equator. The most favourable localities for harbouring Mollusca are among the bays and reefs of archipelagoes where the coasts are low and shelving, and where the water remains shallow at some distance from the shore. On this account the Philippine and Gallapagos Islands afford rich harvests to the collector, but bold and rugged coasts, particularly if the result of volcanic agency, are not prolific in mollusks; the waves dash against them and rend off large masses, which, falling into the sea, alter the nature of the floor, while the soundings give a great depth of water close in shore. This we found to be the case with the Bashees; when, however, the tops of ancient submarine mountains are crowned with belts of coral, as in the Loo-Choo, Meiacoshima, and Corean groups, mollusks are tolerably abundant; but even here their existence seems to depend upon the presence of coral. In Quelpart, for instance, where the perpendicularity of the sides of this deep-seated submarine mountain will not allow of the formation of coral, few shells are found. This island appears to be surrounded by a zone of lower submerged hills, for in lat.  $33^{\circ} 24' N.$ ,  $127^{\circ} 47' E.$ , we made the east point (west  $37''$ ) and obtained soundings in fifty-five fathoms; as we neared the land, however, the water gradually increased till within a distance of five miles, when it again gradually decreased, and the same circumstance was observed on approaching it at other points. *Haliotis gigantea* was found strewing the ground in large numbers; the *Terebratula picta* of Chemnitz, and other species, were obtained from the deep channels between the islands, and *Stomatia rubra* and *Crepidulæ* from the reefs.

Among these islands we were fortunate enough to discover four new species of Chitons, a circumstance the more satisfactory from the fact of so few species of this genus having been noticed in the Asiatic region, and most of those confined to the Philippine Archipelago; for while the Australian region boasts of the greatest number of *Haliotides*, the American can muster the largest amount of Chitons, and the other zoological regions would appear to be remarkably deficient in both genera. Out of one hundred and forty-three species described and figured in Mr. Recve's beautiful monograph of the genus, sixty-six come from America, forty-two from Australia, fourteen from Asia, twelve from Europe, and nine from Africa. But two or three have been found in the Pacific, while ten are peculiar to the Philippines. *Chiton hirudiniformis* was found by us among these islands, and is also peculiar to the Gallapagos Archipelago; and *C. spiniger*, of the Philippines, appears to represent *C. occidentalis* of the West Indies. The largest and most brilliant species come from the tropical seas; the smallest and most obscure from cold climates, or from considerable depths, in accordance with the known laws of geographical distribution. Northern Chitons have the valves covered either partially or entirely by the mantle, as in *Chiton Sitkensis*, *C. tunicatus*, and *C. auriculatus*; the *C. chlamys* will probably be found to have come originally from a cold climate. I have frequently found Chitons among the islands of the Oriental Archipelago, adhering to the stones in the society of *Neritæ* and *Patellæ*, at very considerable distances from the water, and perfectly exposed to the burning rays of a tropical sun. At Cape Rivers we discovered, adhering to stones on the reefs, three new and beautiful species, namely, *Chiton pectatus*, *C. acutirostratus*, and *C. formosus*.

The floor along the eastern coast of Africa consists of fine clear sand, forming in many situations vast accumulations, like the Agulhas bank projecting from the Cape, which arises to within a few fathoms of the surface. These banks are prolific in *Ancillariæ*, *Marginellæ*, and *Bulliæ*. The shells collected at the St. Brandon Shoals, or Gargados Garajos, were remarkable for their white appearance; *Voluta costata*, *Cerithium*, and *Cardium* were all of this colour, as were also the only species of Cone (*Conus verrucosus*) and of *Pleurotoma* (*P. virgo*).—A. A.



# MOLLUSCA,

BY

ARTHUR ADAMS, F.L.S., & LOVELL REEVE, F.L.S.

---

## I. CEPHALOPODA.

The chief objects of scientific interest collected during the voyage of the Samarang among the highest forms of Mollusca, consist of a new *Loligopsis*, *Argonauta gondola* with the soft parts, a species not hitherto described which we propose to name *A. Owenii*, and two mutilated specimens of the *Spirula Peronii*. No living *Nautilus* was detected throughout the course of the expedition, though it was assiduously sought for, which circumstance may be recorded in further testimony of the rare appearance of this deep-dwelling animal on the surface of the ocean. A very complete specimen was collected by Sir Edward Belcher in the Sulphur, and its anatomy has been fully demonstrated by Owen, Valenciennes, and Vogel. The capture of the animal of *Spirula*, of which the shell has been so long and abundantly known to naturalists, though imperfect, was a matter of great good fortune, and it is with much pleasure we are enabled to give a detailed account from the pen of Professor Owen of such parts of its anatomy as the specimens present. The drawing of *Argonauta gondola*, taken from life, presents an additional evidence, if any were needed, of the cephalopodic origin of these fragile Paper Sailors, and the *Loligopsis*, of which Professor Owen kindly promises the dissection before the close of our volume, will prove a valuable acquisition towards the history of that somewhat obscure and little-known genus.

Before proceeding to describe these animals in detail, Mr. Adams notes the following on the *Octopi* of the Eastern Seas.

*Octopi* of enormous size are occasionally met with among the Islands of the Meïa-co-shimah Group. I measured one, which two men were bearing on their shoulders across a pole, and found each brachium rather more than two feet long, giving the creature the power of exploring an area of about twelve feet

B

25

without moving, taking the mouth for a central point, and the extremities of the arms, to describe the circumference. Dorsal plates of *Sepiæ*, a foot and a half in length, are found strewn the beaches. I have frequently observed the *Sepiæ* and *Octopi* in full predatory activity, and have had considerable trouble and difficulty in securing them, so great is their restless vivacity at this time, and so vigorous are their endeavours to escape. They dart from side to side of the pools, or fix themselves so tenaciously to the surface of the stones, by means of their sucker-like *acetabula*, that it requires great force and strength to detach them. When removed, and thrown upon the sand, they progress rapidly in a sidelong, shuffling manner, extending their long arms, ejecting their ink-like fluid in sudden violent jets, and staring about with their huge shining eyes, which at night are luminous, like a cat's, in a very grotesque and hideous manner. *A.A.*

### 1. LOLIGOPSIS, *Lamarck*.

1. LOLIGOPSIS ELLIPSOPTERA. *Lolig. pallio* magno, laxo, infundibuliformi, anticè aperto, semipellucido, per cujus parietes viscera obscurè conspiciuntur, extremitate caudali longâ et fastigiâtâ, confirmatâ, atque intus corpore longo, gracili, penniformi, corneo sustentatâ; *lobis* caudalibus, sive pinnis, magnis, depressis, extra rotundatis, formâ semicirculari conjunctis, pinnam ovalem horizontalem terminalem efficientibus; *infundibulo* permagno, extremitate truncatâ; *capite* magno, rotundato, utrinque dilatato, oculis grandibus, depressiusculis, argenteo-iridescentibus, pupillo nigro; *brachiis* octo trifariam divisus, duobus superioribus medianis, tribus inferioribus brevibus, acetabulis undique munitis.

HAB. North Atlantic Ocean.

The *Loligopsis* belongs to that family of Cryptodibranchiate Cephalopods which is characterized by the possession of eight brachial appendages around the head; differing in this respect from the *Loligo* of Lamarck, and the *Cranchia* of Leach, which belong to the decapodous division or those with ten arms. M. de Férussac considered, however, that the genus *Loligopsis* should be reunited with *Cranchia*, so little was then known of the nature of this mollusk. Lesueur has bestowed the name of *Leachia* on this genus, which, in addition to its conferring an honour on our illustrious countryman, Dr. Leach, would, perhaps, have been more appropriate than the received appellation, which sometimes tends to confound it with *Loligo*. This present species, which appears to come nearest to the *Loligopsis pavo* of D'Orbigny, is of a delicate flesh colour, with scattered, pale brown blotches, the whole surface of the mantle being finely punctulated with a deep brown colour. The mantle is large, loose, infundibuliform, and wide open anteriorly; it is semipellucid, and the internal viscera may be indistinctly seen through its parietes. The caudal extremity is long and tapering, strengthened and supported internally by an elongated, slender, pen-shaped, corneous body. The caudal lobes, or fins, are large, flattened, rounded externally, semicircular in outline, and forming together an oval, horizontal, terminal fin, which constitutes the principal organ of progression. The funnel, of great size, is nearly cylindrical, semitransparent, and rather expanded at its fixed or basal portion. The head is large, rounded, and considerably dilated from side to side. The eyes are very large, in form of a flattened spheroid, having the black-coloured sclerotic marked, on the under-surface, with four silver spots; the iris is of a beautiful golden hue, and the pupil is large, black, and circular. The brachia, eight in number, are divided, by reason of their length, into three sets: the central set, con-

sisting of two upper and two lower, are short; the two external and upper ones are longer and thicker; and the two external and lower are of much greater length, strength, and thickness. They are all provided with acetabula on the lower-surface.

The name *ellipsoptera* has been suggested by the curious oval fin which is developed at the caudal extremity. The drawing which accompanies this description was taken from the living animal, and is enlarged one-third of its natural dimensions.

PLATE I. Fig. 1. Increased one-third larger than life.

## 2. ARGONAUTA, *Linn.*

Of the Argonauts captured during the voyage, we are enabled, with the assistance of some specimens collected in the same seas by Mr. Cuming, to confirm the value of two very excellent species, *A. hians* and *gondola* described in 1817 by Mr. Dillwyn<sup>1</sup> but not figured; one subsequently named *A. nitida* by Lamarek, the other quoted by M. Deshayes as a variety of *A. tuberculosa*. To these we have the pleasure of adding a third species, *A. Owenii*, which has been satisfactorily determined by a comparison of the shells of each in different stages of growth. The soft parts of *A. hians* are figured in the beautiful work of De Férussac and D'Orbigny on the Cephalopods.<sup>2</sup> Of the *A. gondola*, Mr. Adams was fortunate enough to preserve a young individual for some days alive, during which time he made a careful drawing of it, including the development of the ovum. Living specimens were also taken of the *A. Owenii*, and placed in spirits, but the liquid having escaped from the bottle through some accident in the packing, the animals dried up and were found partially decomposed; the shells were preserved entire and form a characteristic series of different ages, agreeing with one of adult growth in the collection of Mr. Cuming.

1. ARGONAUTA GONDOLA. *Arg. corpore* elongato-ovato, lateribus subcompresso, pallio amplo punctis grandibus vividè rufis ornato; *capite* subangusto, *brachiis* tumidis breviusculis, acetabulis paucis, grandibus confertiusculis rufo-marmoratis; *velamentis* minutè rufo-punctatis; *infundibulo* lato, breviusculo, ad extremitatem bifurcatim tubuloso; *testâ* lateribus subplanulatâ, radiatim rugatâ, rugis subprominentibus, vix undulatis, alternis brevioribus, medio descendentibus, supernè dilatâtâ, auriculis extrorsum valdè prolongatis; *carinâ* latissimâ, fortiter tuberculatâ, tuberculis acutè compressis; *aperturâ* latissimâ, suboblongo-quadratâ, anticè utrinque spiram canaliculatâ; *colore* lacteâ, sordidè fusco ad latera plus minusve tincto. *A. gondola*, *Dillwyn, Descriptive Catalogue of Shells*, vol. i. p. 335.

HAB. South Atlantic Ocean.

The animal of *A. gondola* approaches nearer to the *A. hians* figured by De Férussac and D'Orbigny in the work already referred to; from which the shell differs most remarkably by the outwardly prolonged growth of the auricles on each side of the spire. The keel is moreover wider with the tubercles rather distant and more compressed. The wrinkles are much less numerous than in *A. tuberculosa*, and do not fade into solitary warts as in that species.

<sup>1</sup> Catalogue of Shells, vol. i. p. 334-5.

<sup>2</sup> Hist. Nat. Moll. 1834. pl. 5.

There is a considerable difference in the general aspect and disposition of the spots, &c., between the animals of *Argonauta gondola* and *argo*. In *A. gondola* the sac-like mantle is more ovoid and elongated; the head is narrower; the funnel broader, shorter, and furnished, at the upper and anterior extremity, with two conical elongations; the eyes are considerably larger and slightly more prominent; the tentacular arms are much shorter in comparison and of greater width, more particularly at their basal portions; the suckers are much larger, more prominent, and placed closer together. This species varies also considerably in colour from *A. argo*. The extremities of the brachia are marbled with deep red-brown, and, in the other parts, are covered with large, irregular, oval, reddish blotches, each margined with a dark colour; the circumference of the suckers is marked with brown spots; the upper surface of the funnel is covered with pale pink, rather scattered and irregular, quadrate blotches, margined with dark red-brown; the mantle, on the dorsal surface, is densely sprinkled with round and square spots of a chestnut-brown and crimson of different sizes; the velamenta are minutely dotted with crimson and red-brown, and have a more bluish tinge than those of *A. argo*; the under surface is mottled and minutely dotted with dark chocolate on the arms, and on the body is marked with small, irregular, dark red-brown spots. *A. A.*

PLATE I. Fig. 2 *a*. Animal swimming, embracing the shell with its velamenta. Fig. 2 *b*, the same divested of its shell. Fig. 2 *c* to *h*, development of the ovum,—*c*, impregnated egg; *d*, three spots appear; *e*, head and mantle indicated; *f*, rudiments of brachia; *g*, yolk-bag seen; *h*, lateral view of the same. Fig. 2 *i*, egg-mass *in situ*; 2 *k*, egg-mass unravelled; 2 *l*, front view of egg-mass. Fig. 2 *m* and *n*, acetabula; 2 *o* and *p*, the mandibles.—Fig. 2 *a*, *b*, *i*, *k*, and *l*, of the *natural size*, the remainder *more or less magnified*.

PLATE II. Fig. 2 *q*. Front view of a full grown specimen of *A. gondola*, from Mr. Cuming's Collection, showing the outward extension of the auricles. Fig. 2 *r*, *s*, and *t*, lateral views of specimens of different ages.

2. ARGONAUTA HANS. Arg. *testa* lateribus convexis, radiatim rugatis, rugis exiliuseulis, vix undulatis, alternis brevioribus medio descendibus, *carinâ* latâ, tubereulis compressis, *aperturâ* subquadrato-oblongâ, auriculis simplicibus; colore fusceseente. *A. hians*, *MSS. Dillwyn, Desc. Cat. of Shells*, vol. i. p. 334. *Argonauta vitida, Lamarck*.

HAB. South Atlantic Ocean.

Several examples of this species, easily distinguished from the *A. gondola* by the following characters, were collected in the South Atlantic Ocean. The wrinkles are more faintly developed, the keel is not so broad, and the tubercles are much less prominent; the auricles are but slightly prolonged, and the shell has frequently a peculiar yellowish-brown glazy appearance, which probably suggested the name given to it by Lamarck. Both animal and shell have been figured by De Férussac and D'Orbigny in the work already referred to. The latter is here introduced for the sake of exhibiting a comparison of the species, and on account of that work being so little known to English conchologists. The shell there figured as the young of *A. hians* is our *A. Owenii*.

PLATE III. Fig. 2 *a*. Front view of the shell showing the aperture and simple auricles. Fig. 2 *b* and *c*, lateral views of specimens of different ages.

3. ARGONAUTA OWENII. Arg. *testâ* lateribus convexo-compressâ, radiatim rugatâ, rugis angustis, valdè prominentibus, undulatis, alternis brevioribus medio descendibus; *carinâ* mediocri, fortiter tuberculatâ, tuberculis valdè promiuentibus; *aperturâ* subangustâ, auriculis simplicibus; colore fulvo-fusceseente.

HAB. South Atlantic Ocean.

A fine adult specimen of *A. Owenii* (Fig. 1 *b*), collected by Mr. Cuming, has enabled us

to attach an interesting importance to several examples of this species in an early stage of growth, which were captured alive, but unfortunately dried up from an accident in the packing. It is mainly distinguished by the prominent structure of the lateral wrinkles and tubercles, and these are developed with equal force in the youngest specimens. It is clearly distinct from *A. hians*, for the young of which species a small specimen was figured by De Férussac and D'Orbigny in their great work on the Cephalopods, Hist. Nat. Moll., published in 1837. In naming this shell we have availed ourselves of the rare occurrence of a new species to dedicate it to Professor Owen.

PLATE III. Fig. 1 *a*. Front view of the shell, showing the aperture and simple auricles. Fig. 1 *b*, *c*, and *d*, lateral views of specimens of different ages.

On our passage home across the South Atlantic, I enjoyed numerous opportunities of observing the animals of *Argonauta argo* and *gondola* in the living state, specimens having been captured by us in large numbers by means of a trawl, as they came to the surface of the water at the decline of day in calm weather, in company with *Carinaria*, *Hyalea*, *Firola*, and *Cleodora*. My observations all tend to prove, as might have been expected, the accuracy of Madame Power's observations on the Cephalopodic origin of the shell, and the fanciful nature of the statements of Pliny, Poli, and the poets.

It is quite true that the female Argonaut can readily disengage herself from the shell, when the velamentous arms become collapsed, and float apparently useless on each side of the animal; and it is equally certain that she has not the power or, more properly, the sagacity to re-enter her nest and resume the guardianship of her eggs. On the contrary, she herself, if kept in confinement, after darting and wounding herself against the sides of the vessel in which she is confined, soon becomes languid, exhausted, and very shortly dies. Numbers of male Argonauts were taken by us, at the same time, without any shells, and this being the season of oviposition may account for the females, in such a number of instances, being found embracing their calcareous shell-nests, which, so ingeniously formed by the instinct of the mother for the protection of her eggs from injury, resemble, in some measure, those nidamental capsules secreted by many marine Gastropods for the preservation of the immature embryo.

To satisfy myself that the thin shell of the Argonaut is employed by the female merely as a receptacle in which to deposit her eggs, I dissected a specimen of *A. gondola*, with an egg-mass occupying the discoidal part of the shell and the posterior portion of the roof. The eggs, very numerous, ovoid, pale yellow, and semipellucid, are all united together by a delicate, glutinous, transparent, filamentous web which is attached to each ovum by a slender tapering peduncle at the anterior extremity. The entire egg-mass is suspended to the body-whorl of the spire at its anterior part by means of a pencil of delicate glutinous threads which retain it in a proper position.<sup>1</sup>

The posterior globular part of the body of the female is in close apposition to the mass of ova, and thus, like a strange aquatic Mygale, or other spider, does this remarkable Cephalopod carry about her eggs in a light calcareous nest, which she firmly retains possession of by means of the broad, expanded, delicate membranes of the posterior pair of tentacles. When disturbed or captured, however, she loosens her hold, and leaving her cradle to its fate, swims about independent of her shell.<sup>2</sup> There is not, indeed, the slightest

<sup>1</sup> Poli in his magnificent work "Testacea utriusque Siciliae," where he has represented the egg-mass, though not "in situ" (Tab. XLI. f. 2.) but unravelled, observes concerning it: "Ovorum congeries eboris nitorem æmulantium, partim jam ab ovario emissa, ac racemorum instar composita, cymbæ puppi involutæ adhærebat." Professor Owen, in his lectures on Comparative Anatomy, p. 360, mentions the same fact: "In the Argonaut the minute ova are appended by long filamentary stalks to the cavity of the involuted spire of the shell where they are hatched."

<sup>2</sup> This is probably but for a limited period, as it does not appear that the animal is able to exist long when disengaged from its shell.

vestige of any muscular attachment. In the specimen of *A. gondola* from which the accompanying drawing was made, the ovary was distended with ova, but in a much less advanced stage of development than those deposited in the shelly nidus. Some of these latter were sufficiently matured to enable me to trace, under the microscope, the early indications of the being of the Argonaut; and although the progress is not followed very far, it is sufficient to ascertain the similarity with the changes observed by Poli in the same genus, with whose writings I afterwards compared my remarks; the only difference of any importance appears to be that Poli regarded as the shell what I have called the yolk-bag. At first, the ova are semi-opaque, pale yellow, and apparently speckled minutely, which is owing to the granular yolk; afterwards they become clouded with light brown blotches, and three dark spots make their appearance, one for each eye and one for the viscera; these spots, in the next stage, approach each other, and a faint outline of the future Argonaut is visible, a club-shaped embryo, rounded in front and tapering behind. The front part is then lobed; a black mark for the horny mandibles is perceived, and the eyes are large and prominent; the yolk-bag, or vitellus, is next seen very distinctly, and the processes extending from the head are more elongated. Here, however, I was obliged to stop, this being the most perfectly developed embryo I could find amongst the ova. The eggs in contact with the front part of the body-whorl of the shell, where the egg-mass is attached by the glutinous threads, are the most forward in their development, while those in the posterior part of the chamber are much less matured.<sup>1</sup> *A.A.*

### 3. SPIRULA, *Lamarck*.

Description of two mutilated specimens of *Spirula Peronii*, with some observations on *S. australis* and *reticulata*.

PLATE IV.

(By PROFESSOR OWEN, F.R.S.)

IT IS remarkable of the two known genera of polythalamous Cephalopods, *Spirula* and *Nautilus*, that both should be noted for the extreme rarity of the entire animal, as compared with the frequency of the shell in collections of Natural History; and this is more particularly the case with the *Spirula*, on account of the mutilated state, with a single exception, of all the few examples of the animal or soft parts hitherto described. The specimen captured by Capt. Sir Edward Belcher in the Indian Archipelago, is no exception to the rule. Like that inspected and described by Professor De Blainville in the *Annales Françaises et Etrangères d'Anatomie et de Physiologie, pour l'Année, 1837*, vol. i. pp. 369, 382, the head has been torn from the body, and the opposite extremity, or the part answering to that which supports the appendages, described as fins in M. de Blainville's memoir, is also wanting; so that the last whorl of the shell is terminal, as in the specimen figured in the Atlas of the Voyage of Péron and Lesueur, pl. 30. fig. 4. It does not necessarily follow, however, that this difference is the result of mutilation, and that the terminal part in question has existed in these specimens and been torn away. At least in Sir Edward Belcher's specimen, the rounded posterior terminations of the lateral lobes of the mantle, fig. 1, 4, 5, 7, *d d*, are entire, and covered by the epiderm, which shows no sign of laceration or abrasion.

To Lamarck<sup>1</sup> and Péron<sup>2</sup> we owe the knowledge of the acetabuliferous character of the *Spirula*; whence, after the dissection of the *Nautilus*, its dibranchiate organization was to be

<sup>1</sup> Encyclopédie Méthodique, Atlas, Coquilles, pl. 465, fig. 5, *a b*.

<sup>2</sup> Loc. cit.

inferred.<sup>1</sup> M. de Blainville<sup>2</sup> has demonstrated some of the chief characteristics of the dibranchiate type of structure from which the decapodous character of the head (wanting in his specimen) might be deduced, and thus concomitant inferential proof be had of the accuracy, before doubted, of Lamarck's figure. Finally Mr. Cuming's specimen, described and figured by Mr. Gray<sup>3</sup> and Mr. Lovell Reeve,<sup>4</sup> sets at rest the question of the external decapodous characters of *Spirula*, and confirms M. de Blainville's description of the terminal appendages of the mantle and the position and degree of exposure of the shell, at least in certain specimens of *Spirula*. It needed but the examination of the internal structure of Mr. Cuming's specimen to prove the accuracy of the inference of the dibranchiate type of internal organization from the decapodous external structure of the animal, and reciprocally.

Another point also remained for consideration, viz., whether the figure by Péron (pl. iv. fig. 1 \*), showing a comparative shortness of the mantle in proportion to its breadth, and the absence of the terminal disc and fin-like appendages, truly indicated such a form of *Spirula* in nature? Or, whether the continuous exposure of so large a portion of the outer whorl of the shell, as is represented by Péron, might not be due to accidental laceration of the disc and appendages from the rest of the mantle? And whether, if such differences were natural, they were differences of age, or sex, or species? Towards the solution of these questions, and the completion of the anatomy of the *Spirula*, the facts which I have now to offer, though not of much importance, may contribute: they are the result of careful and, I trust, faithful observation, and every little will be welcome to the genuine student of nature in a question of so much difficulty and interest as the present.

The specimen of *Spirula* (pl. iv. fig. 1, 4, 5, 6) which Capt. Sir Edward Belcher was so obliging as to place in my hands for description and dissection, like that of M. de Blainville, had the head and its appendages torn away; but the infundibulum (*c*) was left, with the mantle and shell (*ck*). The shell, partly imbedded in the hinder end of the mantle, had the greater part of the last whorl uninterruptedly exposed (fig. 7), and the thick borders of the terminal lobes of the mantle (*dd*, fig. 4, 7, and 11) which extended over the umbilicus and inner whorls of the shell, were smooth, rounded, and entire. The exposed part of the shell was coated by a thin epiderm: the last whorl was directed from the ventral to the dorsal aspect, bending round the end of the body, and advancing forwards, not again entering the mantle, but with the last or open chamber, terminating freely over a small opening of the mantle (fig. 6, *fn*) through which the membranous siphon of the shell (*sl*) passed, and from which opening part of the second whorl of the shell protruded. The proportions of the body, or mouth, especially its shortness as contrasted with its dorso-ventral diameter, accord with those of Péron's specimen (op. cit. and fig. 1 \*): as does also the exposed position of the last whorl of the shell, concomitant upon the absence of the terminal fleshy disc and its appendages.

<sup>1</sup> Owen, Memoir on the Pearly Nautilus, p. 54, and Classification of Cephalopods, Zool. Trans. v.ii. pp. 123, 129.

<sup>2</sup> Loc. cit.

<sup>3</sup> Annals of Natural History, vol. xv. p. 257. pl. XV.

<sup>4</sup> Elements of Conchology, p. 16. pl. A.

Figures 5 and 6 give a view of the mantle of the specimen here described from the dorsal aspect: the anterior aperture of the mouth is trilobed, the lobes obscurely pointed; one, *a*, projects forwards from the middle of the dorsal aspect, the two others, *b b*, from the ventro-lateral aspect, on each side of the base of the funnel, *c*. Some lacerated remnants of the retractor muscles of the head also projected from the aperture of the mantle, as figured at *e*, fig. 1; but these are omitted in fig. 3, as they obscured the view of the funnel or expiratory tube, *c*: letters *d d* are the lateral terminal lobes of the mantle applied over the inner whorls and umbilicus of the shell (*ch*). The ventral aspect of the specimen, fig. 4, shows the beginning or narrower part of the last whorl of the shell as it first protrudes from between the lateral terminal lobes of the mantle, *d d*. The two ventro-lateral anterior lobes are shown at *b b*, and the funnel (*c*) projecting between them: behind this is the torn portion of the muscles of the head.

The side view of this specimen, fig. 1, shows the greater antero-posterior diameter of the mantle as compared with the transverse diameter in fig. 4 and 5. It also shows the free termination of the shell at *f*, and the rounded contour and extent of the terminal lobe, *d*. This part was subjected to a careful and minute scrutiny, but no signs of laceration could be detected: it presented a thick convex border like the bottom of a bag or sac on both sides of the shell (see the magnified view in fig. 11); this border being, as it were, tucked up or bent in towards the umbilicus; becoming thin and smooth and of a softer texture next the shell, as shown in fig. 7, *d* and *e*, which gives a view of the hinder extremity of the specimen, with the lateral terminal mantle-lobes drawn a little away from the shell to show the delicate portion of the pallial membrane, *e*, which passes from one lobe to the other through the umbilicus.

The ordinary surface of the mantle is smooth. Its structure, like that in other di-branchiates, presents a delicate epiderm, a thin stratum of pigmental cells, and a fibrous muscular corium forming the chief substance of the mantle. The dorsal part of the mantle shown in fig. 5, was continued from the anterior pointed lobe, *a*, backwards to beneath the open end of the shell at *fn*. fig. 2; where it thinned off to the border of a small aperture through which projected the dorsal part of the shell; there was a small space between this whorl and the anterior border of the aperture, through which aperture the membranous siphon (*sh*) was continued from the shell into the cavity of the mantle. The aperture seemed much too small to have ever admitted the termination of the shell, *f*: but it is to be presumed that after the natural connections of the last chamber of the shell with the muscular retractors of the head had been violently disturbed, the mantle may have contracted at the rent, from which the open end of the shell was withdrawn, to the dimensions of the aperture that now admits only the siphon. Nothing at least can be safely argued against M. de Blainville's description of the muscular attachments of the *Spirula* to its shell from the obviously mutilated specimen here described. A small part of the second whorl of the shell was visible at the aperture, *fn*.



The dissection of the specimen was commenced by laying open the mantle along the median line of the ventral or infundibular aspect to near the border of the posterior fossa from which the shell began to protrude. On divaricating the divided mantle, the parts were exposed which are shown in fig. 11; viz., the base of the funnel, with its two narrow, elongated articular cavities (*g g*), the linear elevations on the inner surface of the mantle corresponding thereto (*g' g'*); the membranous and muscular tunic, *h*, enveloping the liver, perforated on each side posteriorly by the pallial nerve-trunks, which immediately swell into the pallial ganglions, *i*, fig. 12 and 13; posterior to which ganglions the bases of the gills are attached; and, in the ventral interspace of these, there is a low conical prominence with three valvular apertures: the middle one, of an infundibuliform anus, *k*, fig. 12, and on each side a more minute orifice (*l*) with a plicated prominent border. Behind the base of the left gill, *n'*, a fourth orifice at the extremity of a short tube (*m*, fig. 12), also communicates with the branchial or external compartment of the pallial cavity. The branchial chamber showed no trace of a muscular or membranous septum ("bride antérieure," Cuv. in the Octopods). The gills (*n n'*) have the usual elongated narrow triangular form: each is supported on a fleshy stem, extended along its outer border, perforated by the branchial artery, and connected to the walls of the branchial chamber by a duplicature (*n''*, fig. 13) of the delicate lining membrane, which is reflected upon the basal half of the stem, and invests the whole complex gill: the base of the stem itself is attached to the septum dividing the branchial from the pericardial and visceral chambers. Each gill consists of about twenty-four pairs of plicated folds extended between the fleshy stem, and the trunk of the branchial vein that traverses the opposite or inner border of the gill. The principal venous trunks (*o*, fig. 13) of the general system, enter the peritoneal compartments on each side the rectum, and there develop the venous follicles, in the form of irregular puckered subelongate bulgings out of their coats, which give a spongy aneurismal character to their trunks; they unite into a single trunk on each side, which enters a small branchial heart, *p*, with an appendage. The branchial artery is continued directly into the fleshy stem. The branchial veins, *q*, pass behind the spongy veins, and terminate in the outer ends of a transversely elongated fusiform ventricle, *r*, from which a large anterior and small posterior aorta is given off.

Directing my attention, next, to the mass covered by the muscular investment, *h*, I slit up the funnel and exposed the small terminal valve, *c'*, fig. 14, and raising the valvular base of the funnel, removed, first, the covering formed by the lining membrane, and exposed the longitudinal fasciculi of the muscular tunic, *h*, fig. 14. On dissecting away this, as on the left half in fig. 14, the corresponding lobe of the liver was shown, as at *s*. On removing the whole of the muscular investment, together with the funnel, the parts were exposed which are shown in fig. 15. The liver consists of two lobes, distinct from their anterior apices (*s s*) to near their opposite ends: here they had been torn, so that whether they were distinct throughout or not, I could not determine. On divaricating them, as in fig. 15, the œsophagus, *t*, was seen penetrating their interspace, with the aorta and the trunk of the visceral nerve. Behind the

funnel was found that part of the cartilaginous cranium which forms the capsules of the organs of hearing: these formed two oval cartilaginous cups (*w*), their walls confluent at the median line, but their cavities distinct, with a thin semitransparent oval portion on their ventral walls, through which the small opake white otolite within could be discerned: the line is drawn from this thinner part to the letter *w*, in fig. 15. Behind the ear-capsules emerged the œsophagus, with the slender duct, *v*, of the large salivary gland, *u z*, and on each side were the larger pallial nerves, *i i*; these indent the sides of the salivary gland in their passage downwards, backwards, and outwards, to penetrate the lateral fasciuli of the muscular investment of the liver. The œsophagus does not expand into a crop or ingluvies, but maintains the same diameter until it terminates in a small stomach, *x*, which is succeeded by a second cavity of almost equal size, *y*, forming the laminated or pancreatic sac, which receives the ducts of the liver; these (*c y*) appeared to have been beset by numerous minute cystic follicles. The intestine is very short, and makes one slight bend backwards before it advances, as rectum, to terminate in the infundibuliform anus, *k*, which it forms as soon as it has perforated the peritoneal septum, shown in fig. 11. A very minute pyriform ink-bag, *z*, is situated close to the rectum, and its duct opens within the verge of the anus. The anus does not protrude and float freely in the branchial chamber, nor is it provided with valvular or filamentary appendages.

The visceral cavity is continued into each of the terminal lobes of the mantle, as shown in fig. 15, where they are laid open. They were occupied principally by the generative organs, which seemed to be in a feebly developed state. Either from the state of the specimen or my own ill success in the attempt, I could not satisfactorily make out the precise forms and relations of these organs. On the right side was situated the principal gland, either ovary or testis, *A*, and on the left side there was the chief part of the efferent duct, *B*, either vas deferens or oviduct, slightly convoluted, and complicated with some other parts where it communicated below, or behind, the intestine with the ovarium or gland on the right side. This gland consisted of minute, close-set, subelongate follicles, with the cellular nuclei of either ova or spermatozoa.

From the acceptable Mémoire by Professor de Blainville, “Sur l’animal de la *Spirula*, et sur l’usage du siphon des coquilles polythalamées,” published in the *Annales Françaises et Etrangères d’Anatomie et de Physiologie*, tom. i. p. 369 (1837), we learn, that in the *Spirula* the funnel has its parietes entire<sup>1</sup> (i. e., not longitudinally slit, as in the *Nautilus*); that the gills are two in number; that the intestinal canal extends between the two masses of the generative apparatus, is accompanied by an ink-bag, and terminates by a small free floating appendage; and that there is an ovary and an organ of digestion.<sup>2</sup>

<sup>1</sup> “L’entonnoir fort considérable entièrement fermé.” p. 378.

<sup>2</sup> “Vers le milieu de la face inférieure de la masse viscérale le canal intestinal se terminant par un petit appendice libre, flottant, largement ouvert, absolument comme dans les sèches, et accompagné dans toute son étendue entre les deux masses de l’appareil générateur, par le canal de la vessie à encre, contenant de la matière noire que j’ai

If these facts in the organization of *Spirula* be compared with the following characters of Dibranchiate Order of Cephalopods; viz.,

“The gills not exceeding two in number; but the branchial circulation is aided by two muscular ventricles, situated at the base of each gill in addition to the third systemic ventricle; there is an organ for secreting and expelling an inky fluid. The parietes of the funnel are entire<sup>1</sup>,”—it will afford a striking instance of the power of prediction afforded by the laws of correlation of animal structures, and of the truth of the inference that a Cephalopod “proved to have eight short arms and two long tentacles,”<sup>2</sup> must, notwithstanding it possessed a polythalamous shell, have the characteristic organization of the Dibranchiate Order, in contradistinction to that of the Nautilus, the type of the Tetrabranchiate Cephalopods.

The additional facts derived from the dissection of the specimen obtained by Capt. Sir Edward Belcher, show that the funnel of the *Spirula* is provided with an apical valve, and with two basal lateral joints; that the skull is provided with two large cartilaginous acoustic capsules with otolites; that the œsophagus, after passing through the cartilaginous skull, rests upon a large salivary gland, and is then continued, preserving its slender diameter, to a small gizzard; that this is followed by a laminated pancreatic bag, from which the short intestine proceeds and forms, after one slight bend, the rectum; that the anus is infundibuliform, and without an appendage; that the liver consists of two lobes enveloped in a muscular capsule; and that the cystic ducts are beset with numerous glandular follicles before terminating in the pancreatic sac; that each gill has its branchial heart, and that this heart is provided with an appendage; that the systemic heart is transversely fusiform, with an anterior process; and that the branchial compartment of the mantle is devoid of any trace of median septum. By these additional facts we are enabled to test the value of the assumed co-existence of certain modifications of the Dibranchiate structure with the superaddition of two peduncles to the eight ordinary arms, as shown by the figures of the *Spirula* given by Lamarck and Péron.

The Octopods, both *Octopus* proper and *Argonauta*, have a well-developed septum of the branchial chamber: Cuvier describes it as the “bride antérieure qui lie la bourse à la masse viscérale.” The muscles corresponding to this “bride antérieure” also exist in *Sepiolo*; but in the Cuttles (*Sepia*) and Calamaries (*Loligo*), both these muscles and the septum of the branchial chamber are absent as we find them to be in *Spirula*. The base of the funnel is provided with a large valvular fold on each side in *Octopus* and *Eledone*, but has no lateral joints; it possesses these joints in the Cuttles and Calamaries, but has not the lateral valvular folds. The interior of the funnel is provided with a valve near its apex in the Calamaries and Cuttles, but not in the Octopods. In the characters of the funnel we find the *Spirula*

pu faire sortir par un petit orifice situé à gauche de l'anus. Les deux parties principales de l'appareil générateur femelle, savoir, d'un côté, à droite un ovaire considérable et de l'autre sans doute un organe de la digestion, formant à eux deux presque toute la face inférieure de la masse.” p. 379.

<sup>1</sup> Art. CEPHALOPODA, Cyclopædia of Anatomy, vol. i. p. 519.

<sup>2</sup> *Ib.* p. 520.

agreeing with the Decapods. The branchial hearts are devoid of the appendage in the Octopods, but this is present in the Decapods, and equally characterizes the *Spirula*. In the Octopods the gullet dilates into a crop, but not in the Decapods, neither in the *Spirula*, in which, as in other *Decapoda*, it is remarkable for its length and tenuity. In *Octopus* the liver consists of one lobe, and has the ink-bladder imbedded in it: in *Sepia* the liver consists of two lobes, and the ink-bag is not in any way connected with it; the *Spirula* agrees with the Cuttle-fish in these respects. In all Octopods the hepatic ducts are simple; in all Decapods they are complicated with numerous small blind pouches, which have been regarded as a *pancreas*; these cystic follicles are equally present in *Spirula*. So far, then, as the organization of the *Spirula* is known, its modifications are those that characterize the Decapodous type of the Dibranchiate structure in the class *Cephalopoda*. If, therefore, the accuracy of Lamarck's highly important original description and figure of the animal, inasmuch as relates to the superaddition of two long peduncles to the eight ordinary arms, had not been confirmed by Mr. Percy Earl's discovery of the entire animal, figured in the Annals of Natural History, vol. xv. pl. 15, and more accurately in Mr. Lovell Reeve's Elements of Conchology, part 1, pl. A., fig. *a, b, c*, and which unique specimen is now in the unrivalled conchological cabinet of Mr. Hugh Cuming, the confidence that had been placed in Lamarck's accuracy would have been fully justified by the well-marked repetitions of the decapodous modifications of the Cephalopodic structure which the dissection of Sir E. Belcher's specimen has brought to light.

The mere description of appearances, even of the interior structure, still less of the exterior surface of an animal, without the deductions which they legitimately yield, is of comparatively small value to the philosophic Naturalist; for of what value are facts until they have been made subservient to establishing general conclusions and laws of correlation, by which the judgment may be safely guided in regard to future glimpses at new phenomena in Nature, such as those which the figures and descriptions of Lamarck and Péron afforded of the *Spirula*, before the publication of the anatomy in the *Annales d'Anatomie*, and in the present Work? The combination of deduction with observation in Natural History has, indeed, been so rare, and the grounds for confidence in such laws of correlation as have served to deduce one type of Cephalopodic structure from the absence of an ink-bag, and another from its presence, have been so recently attained, and are appreciated by so few, that the scepticism in the deductions from such laws in regard to the *Spirula* may be readily pardoned. In perusing the observations of so respectable an authority as the author of the article "*Turritiles*" in the Penny Cyclopædia, tending to show the insufficiency of the grounds of my separation of *Spirula* and *Belemnites* from the *Nautilus*, and other Tetrabranchiate Cephalopods with chambered shells; and the statement of the author of the Elements of Conchology (p. 11), that "a difference in the number of branchiæ seems scarcely of sufficient importance to warrant the association of the *Spirula* with the Argonaut, separate from the *Nautilus*;" I

recollected that these writers had the authority of Cuvier<sup>1</sup> for continuing to associate together Cephalopodic animals with shells so similar in their complex chambered structure, as those of the *Nautilus* and *Spirula*. But at the same time I retained all my convictions that the period would arrive when it should be demonstrated that a Cephalopod with arms and peduncles, like those of a *Sepia*, would have the same type of Cephalopodic organization as the *Sepia*: a type so modified from that of the many-armed *Nautilus* as to forbid their association in the same Order in any system professing to be based on Nature; i. e. on the totality of the organization of its objects.

The chief addition made by M. de Blainville's Memoir of 1837 to the knowledge of the exterior characters of the *Spirula* was the existence of a circular disc with a pair of fin-like appendages ("aplatissement oblique au milieu duquel est un bouton terminal, accompagné à droite et à gauche d'une petite nageoire demi-circulaire," l. c. p. 376. see fig. 15\*, *ac*. in pl. iv.) at the posterior end of the body, covering and concealing the part of the last whorl of the shell which winds round that end, and which whorl was exposed in Lamarck's and Péron's specimen (fig. 1\*) as it is Sir Edward Belcher's (fig. 7). The same disc, with rudiments of the terminal fins or appendages, is present in Mr. Cuming's perfect specimen (fig. 8, *ac*). The disc is called "a thick gland" by Mr. Gray (l. c. p. 259), and a "leathery gland" by Mr. Reeve (l. c. p. 16); but the texture of the part is not described by either author. It remains to be seen whether this appendage be truly constant in nature, or whether it be characteristic of age, or sex, or species. Mr. Gray in his brief notice of some of the exterior characters of Mr. Cuming's specimen of *Spirula*, affirms that "it differs from the Cuttle-fish in being entirely destitute of any fins" (tom. cit. p. 258. 2): but Mr. Reeve, by a more accurate observation of the same specimen, confirms M. de Blainville's description of two terminal and lateral fins to the *Spirula*; stating that "they are clearly definable, one at each lateral extremity, on either side of the terminal gland" (l. c. p. 18). Their condition is accurately given in the figure representing the hind end of Mr. Cuming's *Spirula* (pl. iv. fig. 8, *ac ac*). With regard to the structure of the intervening subcircular disc (*ad*), I could not detect any trace of the pores of glands upon its surface, and the structure of the same part in the mantle of the *Spirula reticulata* (fig. 3 and 9) was that of condensed cellular tissue only. This I determined by microscopical examination. The central orifice (*ad*, fig. 9) leads merely to the interspace between the disc and the last whorl of the shell, and is not the excretory outlet of any glandular cavity. In the specimen of *Sp. reticulata* which consisted of the mantle only, with its terminal appendage and the shell, the latter, by the violence that has torn away the head and viscera, has been displaced and turned half round with the open end of the last whorl projecting through the ventral aperture (fig. 3, *fm*). The lateral fin-like appendages

<sup>1</sup> Règne Animal, vol. iii. (1830) p. 17. "DES NAUTILES.—"Une d'elles appartient en effet à un Céphalopode très semblable à une seiche, mais à bras plus courts; c'est le genre *Spirula*, Lam."

<sup>2</sup> Mr. Gray, however, after having been made acquainted with M. de Blainville's Memoir, corrects his error in a supplementary note in a subsequent number of the Annals (p. 445).

(*ac ac*) differ from the short, terminal, subcircular, true fins in *Cranchia* and *Loligopsis*, in having their plane transverse to the axis of the body instead of parallel with it: their base is attached, in the dorso-ventral direction of the trunk, to the sides of the terminal disc, as shown in fig. 9. Their structure is fibrous, the fibres are collected into fasciculi, directed from the base to the free margin of the appendage; they are probably contractile, but the ultimate fibres are smooth, more minute than those of voluntary muscle, and devoid of transverse striæ. The disc adheres pretty closely to the epithelium of the part of the shell which it conceals. The appendages are part of the disc, which has very little organic connection with the terminal lobes of the mantle. In the specimen obtained by Mr. G. Bennett (fig. 3 and 9), the surface of the integument differs in a well-marked degree from that in Capt. Sir E. Belcher's or Mr. Cuming's specimens. Instead of being smooth, it is pitted by small close-set angular depressions, which give a well-marked reticulate character to the whole surface of the true mantle. The surface of the cellular disc and its appendages is quite smooth. I regard the character of the skin in the mantle of the *Spirula* just described, as indicative of distinction of *species*, and propose for it the name of *Spirula reticulata*. The general shape of the mantle differs from that of the *Spirula australis*, obtained by Mr. Percy Earl in New Zealand, in so far as that, instead of being compressed laterally, it is broadest from side to side; the difference is well shown in the two figures 8 and 9; but I do not lay stress upon it in the question of their specific distinction, on account of the mutilated state of the specimen of *Spirula reticulata*.

Whether the difference in the development of the appendages of the terminal disc in the *Spirula australis* (fig. 2 and 8) and *Spirula reticulata* (fig. 3 and 9) be specific, or due to accident, may be questioned; but from the dotted character of the integument in the figures of M. de Blainville's specimen (fig. 15\*), in which those appendages are as well developed as in *Spirula reticulata*, it might be suspected that the integument presented a similarly reticulate surface; and this may, perhaps, account for the differences in the condition of the anus and the fins, observable in fig. 15\*, copied from M. de Blainville's Memoir, and in fig. 11, which gives a similar view of the parts in Sir E. Belcher's specimen.

Whether the terminal disc be a normal generic character of *Spirula*, cannot be conclusively determined from the actual evidence: it has the character of an adventitious growth, and is certainly not a part of any of the organs of the vegetal or animal functions: the influence of the appendages of the disc in the locomotion of the *Spirula reticulata* must be feeble, if any; in the *Spirula australis* (fig. 2 and 8) they could have had none. Is the disc with its appendages a sexual character? It might serve for the attachment of the cluster of ova after their extrusion, and be peculiar to one sex: that of M. de Blainville's specimen was female. I regret that all my pains failed me in determining the sex of Sir E. Belcher's specimen; had it been unequivocally a male, it would have supported the hypothesis of the sexual character of the appendages in question, since it does not possess them, and seems not to have possessed them.

A second hypothesis of the function of the terminal disc and appendages, present in the individuals or species of *Spirula*, might explain them as organs of adhesion or anchorage when the creature wished to be at rest, and to resist the fluctuation of the surrounding element; and this view derives some support from a passage in Rumphius' 'D'Amboinische Rariteit-Kamer,' p. 68; where, after pointing out the distinction of the shell of the *Spirula* from that of the young *Nautilus Pompilius*, he says: "But, on the contrary, these little Post-Horns (*Spirulæ*) have in their first chamber a slimy (or molluscous) animal, which does hang to the rocks by a thin and small (disc or) door, through which the creature in the first gate goes, and sets itself fast to the rocks."<sup>1</sup> The passage is obscure, and some of the details unintelligible to me; but my experience of the accuracy of Rumphius in regard to the *Nautilus major*, or Pearly Nautilus, gives me confidence in his having drawn his statement from nature respecting the *Spirula*. His description and figure (pl. xx. n. 1) of the shell admit of no doubt respecting the genus which he was describing.

On the hypothesis of the terminal disc and appendages being a specific character, the *Spirulæ* devoid of them and with the last whorls of the shell exposed behind, might be indicated under the name of *Spirula Peronii*, and the second synonym of Lamarck be restricted to such individuals.

To M. de Blainville's description of the soft siphon of the *Spirula*, as a solid tendon by which the retractor muscles of the mantle are inserted into the calcareous hollow siphon, and in which tendon they are said to terminate after filling the last chamber of the shell, I can at present only oppose the clearly recognisable fact that the soft or membranous siphon in Sir E. Belcher's specimens of *Spirula* was hollow,—in fact, a tube. I have already mentioned that it was continued from the hard siphon and last chamber of the shell through the semi-circular aperture of the mantle (fig. 6, *sh*, *fn*) into the visceral cavity, where it was lost in the remains of the membrane or capsule of the lacerated termination of the liver. On gently raising the exposed portion of the siphon (*sh*, fig. 6) with a needle, the soft siphon was withdrawn without sensible resistance from the tube of the hard siphon: the portion so withdrawn must have reached nearly to the innermost whorl. It exhibited a slight segmentation answering to the successively sheathed parts of the calcareous siphon. Under a magnifying power of three hundred linear dimensions, the dark contour of the central cavity could be traced from end to end, the larger extremity withdrawn from the body shewed plainly the circumference of the aperture of the central cavity from which a minute filament, either vessel or nerve, protruded; the texture of the walls of the canal was minutely fibrous, the fibres being longitudinal, and of the size of the elementary fibres of cellular tissue. This difference from the account of the membranous siphon given by M. de Blainville<sup>2</sup> leads me much to desire the opportunity

<sup>1</sup> "Daar en tegen deze Posthoorentjes hebben in hunne voorste kamer een slymerig dier, t'welk aan de klippen hangt, met eenen dunnen en smallen dooren, die door het beest en de eerste gaatjes gaat, en aan de klippen vast zit," p. 68. The marginal indication of this paragraph is "En zit aan de klippen," i. e. "It sits on the rocks."

<sup>2</sup> "Le siphon de la coquille est formé d'une suite de petits entonnoirs s'emboitant plus ou moins les uns dans

of studying in a better specimen the relations of the shell of the *Spirula*, and especially of its last or open chamber with the muscular system of the animal.

And, indeed, notwithstanding the specimen which I have had the good fortune here to examine, has contributed some additional facts relative to the principal parts of the body of the *Spirula*, many others of equal importance still remain to be determined. Such, for example, as the structure of the male organs, the structure of the female organs, particularly as to whether the oviduct be single or double; whether complicated by glandular enlargements, or associated with independent rudimental glands. M. de Blainville notices the fact of one large eye remaining attached to his mutilated specimen. That the eyes are sessile, the law of the interdependencies of the dibranchiate organic characters would justify us in concluding in the Decapodous *Spirula*; but the structure of the eyes and the condition of the cyclids have yet to be determined. The brain and cranium, the principal nerves, the tongue, beak, and lips, are also amongst the wholly unknown organs of the *Spirula*; and every earnest cultivator of Natural History in its comprehensive and truly scientific sense, must greatly desiderate the requisite means of effecting that which would enable the zoologist to say with truth, that he at length possessed an exact description of all the principal parts of the body of the *Spirula*.

#### DESCRIPTION OF PLATE IV.

Fig. 1. Side view of Sir E. Belcher's specimen of *Spirula Peronii*.

Fig. 4. Front view of ditto.

Fig. 5. Back view of ditto.

Fig. 6. Back view with the shell depressed, exposing the aperture of the mantle through which the siphon passed to the base of the liver:—*all of the natural size*.

Fig. 1.\* Side view of the specimen of *Spirula Peronii*, figured by Péron, copied from the Atlas du Voyage aux Terres Australes, tab. xxx. fig. 4.

Fig. 2. Side view of the specimen of *Spirula australis* from New Zealand, in the Museum of Hugh Cuming, Esq., F.L.S.:—*natural size*.

Fig. 3. Side view of a mutilated example of *Spirula reticulata*, captured by George Bennett, Esq., off Timor:—*natural size*

les autres, de manière quelquefois à former un tout solide" (Ib. p. 375). "Le siphon membraneux n'est lui-même qu'une partie de ce muscle (le muscle columellaire ou rétracteur de la tête). Il est assez difficile de concevoir que si le prolongement tubuliforme qui se loge dans le siphon de la Spirule n'est pas creux, il le soit dans le Nautilus," p. 380. To this not very philosophic scepticism of my account of the siphon in the Nautilus, Mr. Broderip has replied by referring M. de Blainville to the easy determination of the tubular structure of the membranous siphon of that genus, by examining its dried remains in any recent Nautilus' shell. He refers to my preparation (no. 900, B, Physiological Series, Coll. of Surgeons), in which a part of the siphon is preserved attached to the animal which I dissected in 1832, and says, "We have minutely examined the preparation, and can vouch for the accuracy of the description; no one at all versed in the subject can see the former without being satisfied that the prolongation of the mantle and membranous tube to form the siphon is tubular, and not solid."—Penny Cyclopædia, Article *Spirulidæ*.



Fig. 7. Hinder end of the body of *Spirula Peronii* (fig. 1, 4, 5, 6):—*twice the natural size.*

Fig. 8. Hinder end of the body of *Spirula australis* (fig. 2):—*twice the natural size.*

Fig. 9. Hinder end of the body of *Spirula reticulata* (fig. 3):—*four times the natural size.*

\* \* The engraver has added to the original drawing the impressions round the aperture of the siphon, discovered by Charles Stokes, Esq.

Fig. 10. Section of the hinder end of the mantle of *Spirula reticulata*, showing one of the terminal sacs of the visceral cavity.

Fig. 11. The specimen of *Spirula Peronii*, fig. 4, with the mantle laid open:—*twice the natural size.*

Fig. 12. Shows the relative position of the anus, *k*, the valvular apertures of the sacs of the venous (renal?) follicles, *l*, and of the generative outlet, *m*. The fig. *k'* shows the termination of the duct of the ink-bag, *z*, within the verge of the vent, *k'*, *magnified.*

Fig. 13. Branchial and systemic hearts and venous follicles.

Fig. 14. The livers *in situ*, with part of its capsule dissected off.

Fig. 15. Cranium, acoustic sacs, digestive organs, branchiæ, &c., of *Spirula Peronii.*

Fig. 15.\* From M. De Blainville's Mémoire Sur l'Animal de la *Spirula*, "Annales Françaises et Etrangères d'Anatomie et de Physiologie," tom. i. 1837.

\* \* In the preceding figures the same letters are used to denote the same parts, and are explained in the text.

## II. GASTEROPODA.

### 1. CONVOLUTA.

Out of from eighty to a hundred species of Cones collected during the voyage of the Samarang, only four proved to be new, the greater number of those of recent discovery having been anticipated by Mr. Cuming during his researches among the Philippine Islands, and described in the 'Conchologia Iconica.' The genus *Ovulum*, not having been examined since the publication of Mr. Sowerby's 'Species Conchyliorum,' afforded a greater amount of novelty. Mr. Sowerby, junr., being engaged in preparing a monograph of this genus for the forthcoming number of his 'Thesaurus,' it was thought desirable to place the specimens collected in his hands for comparison, and we are indebted to him for the descriptions and figures of eleven new species. A few species of *Erato* were collected, and in the genus *Cypræa*, some interesting observations were made at Singapore upon some living specimens of *C. annulus* in its early winged state, procured from the parent animal, and examined in activity under the microscope.

### 1. CONUS.

1. CONUS PAPILLARIS. Pl. V. Fig. 7 *a, b.* Con. testâ fusiformi-oblongâ, spirâ elevato-turritâ, apice papillari, anfractibus supernè acutè concavo-angulatis, peculiariter tenuicoronatis, nodulis subobliquis, infra lævibus; albidâ, aurantio-ferrugineo longitudinaliter strigato-nebulatâ.

HAB. — ?

This remarkable species of *Conus*, undoubtedly new, was found amongst the shells collected by Sir Edward Belcher during his voyage round the world in H.M.S. Sulphur, and

overlooked by Mr. Hinds in describing the Mollusca of that expedition. It had unfortunately no memorandum of its locality.

The upper portion of the whorls is sharply angled, and distinguished by a row of fine obliquely disposed nodules, the interstices between which are stained with the same rusty brown colour with which the rest of the shell is bedaubed. The apex is papillary.

2. *CONUS BORNEENSIS*. Pl. V. Fig. 8 *a, b, c, d*. Con. testâ fusiformi, medio attenuatâ, spirâ acutè elevatâ, anfractibus supernè concavis et angulatis, infra transversim lineari-sulcatis, sulcis ætate plus minusve obsoletis, longitudinaliter lineis incrementi arcuatim striatis; albâ, rufo-fusco sparsim maculatâ.

HAB. North-east coast of Borneo (in ten fathoms, sandy and stony bottom).

The main distinction between this species and the *C. arcuatus*, to which it is so closely allied, consists in its attenuated growth, a character satisfactorily observed by a careful comparison of several specimens with the type of that species in Mr. Cuming's collection.

3. *CONUS FLORIDULUS*. Pl. V. Fig. 9 *a, b*. Con. testâ oblongo-turbinatâ, solidiusculâ, basi tumidiusculâ, liris perpaucis subdistantibus, spirâ striatâ, obsoletè obliquè coronatâ, apice acutâ; violascente-albâ, basi vividè roseo-violaceâ, medio fasciatim immaculatâ, supra infraque aurantio-fusco tinctâ et punctatâ, apice pallidè rufescente.

HAB. — ? (from the Sulphur Voyage).

A shell of rather solid growth, very deeply stained with violet at the base, and delicately suffused with that colour throughout; a pale band being formed round the middle by the interruption of the orange-brown dots, which are painted above and below it. The spire is very indistinctly undulately noded, and faintly spotted with orange-brown, with which colour it is also tinged at the apex.

4. *CONUS PICA*. Pl. V. Fig. 10 *a, b, c, d*. Con. testâ sub-cylindracco-ovatâ, tenuiculâ, tumidâ, inflatâ, spirâ depresso-convexâ, creberrimè impresso-sulcatâ, apice parvo, acutè elato; basi lineari-sulcatâ, sulcis subdistantibus; albâ, fusco-nigricante plus minusve grandimaculatâ et minutè punctatâ.

HAB. Island of Balambangan, north end of Borneo (on a shallow coral reef).

Very closely allied to the *C. spectrum*, but distinct in form and style of painting.

5. *CONUS PIGMENTATUS*. Pl. V. Fig. 11 *a, b*. Con. testâ oblongo-turbinatâ, transversim obsoletè crebrisulcatâ, spirâ striatâ et obliquè coronatâ; albâ, violascente tinctâ, olivaceo maculatâ, flocculis albis hic illic aspersâ, basi et aperturæ fauce vividè cæruleo-violaceis, spirâ albâ, apice intensè roseo.

HAB. — ? (from the Sulphur Voyage).

An extremely interesting species in which the apex is remarkable for its intense crimson-rose colouring in all stages of growth. The ground colour is a pale verdigris blue, the shell is then crossed by olive lines which form two broad bands, and these are sprinkled with little opaque-white flakes ranging mostly in a longitudinal direction, and the crimson apex rising in the centre of a pure white spire is very conspicuous. The interior is a rich violet.

The Cones have the siphon in general very much elongated, and curved upwards and backwards over the shell; the head is usually somewhat produced, and furnished with a retractile proboscis, the eyes vary in position, being in some instances situated on the outer side near the extreme end of the tentacles, whilst in others they are placed in the middle, and even at their outer bases. Their bodies are not unfrequently handsomely marked and marbled, but, as a general rule, are less brilliant in colour than the shell.

The Cones become more numerous and varied in their colours as we approach the equatorial seas. They seem to prefer fissures and holes of the rocks, especially among coral reefs, living in the warm shallow pools within the barrier, where, although slow-moving, they lead a predatory life, boring into the substance of the shells of other mollusks, for the purpose of sucking the juice from their bodies. They crawl but slowly, and usually with their tentacles in a straight line before them. They are very timid, and shrink within their shells quickly on the approach of danger. Some species affect deep water, and one was dredged by us in the Sunda Straits, in thirty fathoms; and another, the *Conus thalassiarchus*, at Sooloo, in about forty fathoms. In the Asiatic region, the species of this beautiful genus seem greatly to predominate, there being more than one hundred and twenty peculiar to this portion of the globe, while there are but two or three known in Europe, about twenty in Africa, thirty in Australia, and about fifty in America. The animal of *Conus aulicus* has the proboscis beautifully varied with red and white, and there is a square and very minute operculum on the dorsal surface of the hinder part of the foot. Its bite produces a venomous wound, accompanied by acute pain, and making a small deep triangular mark, which is succeeded by a watery vesicle. At the little island of Mayo, one of the Moluccas, near Ternate, Sir Edward Belcher was bitten by one of these Cones, which suddenly exerted its proboscis as he took it out of the water with his hand, and he compared the pain he experienced to that produced by the burning of phosphorus under the skin. The instrument which inflicted the wound, in this instance, was probably the tongue, which in these mollusks is long, and armed with two ranges of sharp-pointed teeth.

In many species of *Conus* I have noticed a very peculiar dilatation of the anterior extremity of the siphon, reminding one of that singular inflated portion of the mantle in *Terebellum*, which performs the office of a siphon; and the shell of this genus more nearly approaches those species of Cones in which the eyes become nearly terminal, and in which the operculum, horny and triangular in outline, is partially free. The Cones are not unfrequently marked somewhat in accordance with the colours of their shells. *A.A.*

## 2. OVULUM, *Brug.*

1. OVULUM VOLVA. Pl. VI. Fig. 9. Ovul. pallio elongato, utrinque valdè producto, mamillarum serie regulari prope margine munito, mamillis subequidistantibus; pede et corpore opaco-albis, corporis extremitate posticâ intensè nigrâ, pallio pellucido-carneo, manillis nigricantibus.

The principal specific peculiarity of the mollusk which produces the well-known shell of the Eastern Seas, termed the "Weaver's Shuttle," consists in the mantle being furnished near the edge with a row of blackish nipple-like tubercles extending to the end of the prolonged extremities. The specimen from which the drawing is taken was dredged in about five fathoms, from a rocky coral bottom off the Island of Basilan, between the Islands of Mindanao and Sooloo, in the Mindoro Sea. It was in a living state but had not arrived at maturity, the lip not being thickened or reflected, and of that tenuity, that the mamillæ of the mantle, which, partially withdrawn probably, lined the interior, were visible

through it as represented in the accompanying figure. Whether this peculiarity in the soft parts of the *Ovulum volva* sufficiently entitles the species to rank as a genus, as proposed by De Montford under the name of *Radius*, remains a matter of opinion.

The mantle of the *Ovulum volva* is furnished near the margin with a row of nipple-shaped tubercles, the nipples and areolæ of which are dark coloured. The tubercles extend to the extremities of the beaks of the shell. The foot is of moderate size and folded longitudinally. The tentacles are elongate and subulate. The mantle covers a small portion of the shell on the left or inner side, where it is partially reflected over the pillar lip, but it does not extend beyond the margin of the thin outer lip; at least it did not in the specimen from which this description is taken, which, however, was not perfectly adult. In older specimens, it may perhaps be reflected over the outer lip as well as over the columella. The eye, large and black, is placed on the side of the head, at the base of, and below, the tentacles. In the figure, the dark-coloured tubercles are seen through the shell, the mantle adhering to and lining the interior. In colour, the body and foot of this mollusk are of an opaque pearly white, but the mantle is thin, semitransparent, and flesh-coloured; the posterior sharp produced portion of the foot is sooty black.

The *O. volva* is slow and languid in its movements, sliding along deliberately, and not more sensible to alarm than *Cypræa*. From the foot being rather narrow, and folded longitudinally upon itself, this animal is no doubt in the habit of crawling upon and adhering to the slender round coral branches and fuci, in like manner as smaller species are not unfrequently seen on *Gorgonia*. A.A.

2. OVULUM VERRUCOSUM. Pl. LI. Fig. 7. Ovul. pallio utrinque lobato; pede amplo, tenui, plicato-expanso, capite brevi, planulato, obtusè producto; opaco-albâ, nigro maculatâ, maculis parviusculis, subdistantibus, capite nigro unimaculatâ, tentaculis vertice nigro fasciatis.

The animal of *Ovulum verrucosum* approaches much nearer to the Cowry type than the preceding species, having the mantle partially lobed on either side. The shell likewise partakes more than any other *Ovulum* of the *Cypræa* character; the callosities, from which it derives its name, may be seen in a modified form in the *C. bicallosa*. The soft parts of *O. verrucosum* are of the same delicate opaque white as the hard, the difference being that the former are prettily painted with black spots, the latter unspotted, but suffused with a soft blush of pink. The specimen represented in the accompanying plate was taken alive at the southern extremity of the Island of Mindoro, one of the Philippines, where several were observed gliding cautiously along a bright sandy bottom in shallow water. This species, which De Montford also proposed to elevate to the rank of a genus, under the title of *Calpurnus*, possesses much less claim to that distinction than the preceding.

In the *Ovulum verrucosum* the mantle adheres to the sides, but does not entirely cover the shell. It is dead-white and covered with round black spots. The foot is large, thin, flat, expanded, and marked like the mantle. The tentacula are tapering, of a pure pearly white colour, with a broad black band near their extremities. The eyes are large and black, and placed at the outer base of the tentacles. The head is short and flattened, and ends in an obtuse rounded muzzle. The longest slope and narrowest end is the fore-part of the shell.

In its habits it is a very slow-moving and sluggish mollusk, with all the peculiarities of the Cowries, and exhibits a singularly beautiful and striking appearance under the calm shallow water as it glides

tranquilly along the bright sandy bottom. The spots on the mantle are much smaller and more irregular in form than those on the foot. The head is pure opaque white, with the exception of one large black spot placed in the centre of the fore-part, which, with its large black eyes and black-tipped tentacles, gives it a very peculiar appearance. *A.A.*

3. OVULUM ACUMINATUM. Pl. VI. Fig. 1 *a, b*. Ovul. testâ subovali, in medio sub-ventricosâ, ad extremitates sub-rostatâ, lævi, albâ, longitudinaliter fasciatâ; dorso margine distincto; canalibus ad dorsum elevatis; labio externo crasso, lævi, ad extremitates recedente, anticè sub-angulato, ad canalem emarginato; labio interno tumido, intus unicarinato, posticè spiraliter uniplicato, ad canales rectiusculo.

HAB. The east coast of Bilaton.

Differing from *O. secale* in being proportionately ventricose in the middle, and having the extremities turned upwards at the back.

4. OVULUM COARCTATUM. Pl. VI. Fig. 2 *a, b*. Ovul. testâ elongatâ, sub-cylindraceâ, fulvâ, striatâ, supra medium gibbosâ, ad extremitates coarctatâ, labio externo paululum incrassato, lævi, anticè sub-angulato; labio interno intus sub-depresso, ad extremitates acuminato.

HAB. Straits of Sunda, near Java.

This shell resembles *O. hordacea* in some degree, but is not angular, and has the outer lip smooth. It may, however, very possibly be a young shell.

5. OVULUM RECURVUM. Pl. VI. Fig. 3 *a, b, c*. Ovul. testâ elongatâ, medio ventricosâ, sub-angulatâ; lævigatâ, ad extremitates attenuatâ, recurvâ; labio externo crasso, anticè angulatim arcuato, ad extremitates truncato; labio interno in medio ventricoso, ad extremitates attenuato, recurvo.

HAB. China Seas.

The canals are not so much attenuated as in *O. longirostrum*, and the outer lip is more suddenly narrowed into the anterior canal. It is thick, and pressed closely against the body whorl at the upper part, so as to leave the aperture very narrow. The shell is almost white, slightly tinged with pale buff.

6. OVULUM DENTATUM. Pl. VI. Fig. 4 *a, b*. Ovul. testâ parvâ, oblongâ, sub-angulatâ, minutè striatâ; pallidè roseâ, fusco rubescente variegatâ; canalibus sub-productis, emarginatis; aperturâ angustatâ; labio externo breviusculo, complanato, intus et ad extremitates usque ad marginem dentato; labio interno lævi, intus longitudinaliter sulcato, posticè tumorem elevatum crenulatum ferente, ad canalem recedente; anticè angustato, tumido; ad canalem sub-uniplicato.

HAB. Caramata Passage, near Singapore.

Not so angular as *O. striatulum*. The teeth of the outer lip extend to the outer margin at the upper extremity where they form denticulations. The colour is pale rose, strengthened at the ends with two longitudinal waved bands at the back.

7. OVULUM BULLA. Pl. VI. Fig. 5 *a, b*. Ovul. testâ ventricosâ, subcylindraceâ, lævi, anticè sub-acuminatâ; canalibus brevissimis integris; labio externo in medio sub-rotundo, intus crenulato; labio interno posticè tumorem parvum ferente, ad canalem angustato, uniplicato, intus paululum excavato.

HAB. China Seas.

Differing from *O. margarita* and *O. punctatum* in form, being more cylindrical and very narrow at the anterior extremity.

8. OVULUM FORMOSUM. Pl. VI. Fig. 6 *a, b*. Ovul. testâ elongatâ, in medio sub-angulatâ, violaceâ, ad extremitates fuscâ, lineis puncturatis cinctâ; canalibus brevibus, validè emarginatis; aperturâ angustâ; labio externo in medio sub-angulato, denticulato, ad extremitates brevi, posticè ad marginem externum dentato; labio interno lævi, longitudinaliter sulcato, posticè tumido, ad canalem angusto, rectiusculo, anticè ad canalem rectiusculo.

HAB. East coast of Borneo.

Of an elongated angular form, and of a remarkably bright violet colour, with yellow tips; the spiral striæ are regular and beautifully punctured. The extremities rather produced, the outer lip short at the ends and denticulated, the denticulations reaching the outer margin at the posterior extremity.

9. OVULUM CONCINNUM. Pl. VI. Fig. 8 *a, b, c*. Ovul. testâ parvâ, ventricosâ, angulatâ, albâ vel roseâ, minutissimè striatâ; dorso tumido, anguloso; canalibus brevibus obtusis, integris; aperturâ angustâ; labio externo intus denticulato, in medio anguloso, labio interno posticè tumorem angulosum crenulatum ferente, internè longitudinaliter sulcato, anticè angustato, ad canalem posticum recedente, ad canalem anticum prominente, angustato sub-uniplicato.

HAB. Isle of Capul, Philippines.

A miniature resemblance of *O. angulosum*; more angular, minutely striated with a groove along the inner lip, with an elevated, angular tumidity on the body whorl near the angle. It is white, or pale rose.

10. OVULUM SUB-REFLEXUM. Pl. VI. Fig. 10 *a, b*. Ovul. testâ oblongâ, albidâ, lævigatâ, sub-rostratâ; dorso in medio sub-angulato; extremitatibus sub-recurvis; aperturâ angustatâ; canalibus sub-emarginatis; labio externo lævi, rotundato, supra medium sub-angulato, anticè sub-angulatim arcuato; labio interno posticè tumido, ad canalem producto, recedente, intus longitudinaliter depresso, anticè ad canalem producto.

HAB. Coast of Bilaton.

An oblong, smooth, white shell, with the extremities rather produced, blunt and turned upwards. The outer lip is smooth, round, and flexuous.

11. OVULUM GRACILE. Pl. VI. Fig. 11 *a, b, c*. Ovul. testâ elongatâ, fusiformi, minutissimè striatâ, ad extremitates attenuatâ, recurvâ; labio externo lævi, sub-angulatim arcuato; labio interno lævi, in medio sub-ventricoso, ad extremitates attenuato, acuminato; colore pallidè fulvo, dorso prope marginem longitudinaliter rubro-fasciato.

HAB. East coast of Borneo.

Fusiform, striated, more gradually ventricose in the centre, and less attenuated at the canals than either *O. longirostrum* or *O. recurvum*. At the back, near the margin, is an irregular longitudinal band of dull red, interrupted in the centre.

12. OVULUM NUBECULATUM. Pl. VI. Fig. 12 *a, b, c*. Ovul. testâ ventricosâ, sub-pyriformi, pallidè rubro vel fulvo nubeculato; dorso obscurè costellato; canalibus brevibus, vix emarginatis; aperturâ angustâ, labio externo intus crenulato, prope medium sub-complanato; labio interno tumorem elevatum crassum ferente, ad canalem breve et recedente, anticè tumido, intus excavato, ad canalem sub-uniplicato.

HAB. Isle of Basilan.

More pyriform than *O. carneum*; posterior canal shorter, posterior tumidity more elevated. The colour consists of pale or strong brownish red, arranged in three cloudy bands.

13. OVULUM BULLATUM. Pl. VI. Fig. 13 *a, b*. Ovul. testâ ovali-oblongâ, minutè striatâ, roseo tinctâ, ad extremitates fusco lineatâ; dorso ad marginem sulcato; canalibus sub-productis, integris; aperturâ angustâ, labio externo intus crenato, complanato; labio interno tumido, lævi, intus depresso, sub-sulcato, posticè bullulam prominentem crenulatum ferente, ad canalem sub-tortuoso, anticè sub-excavato, ad canalem uniplicato.

HAB. Caramata Passage, near Singapore.

Of an oval form, striated at the back. The inner lip of the posterior canal slightly tortuous, the outer lip flattened, slanting inwards and crenulated, the body whorl in front near the posterior angle having a raised, rounded, prominent pustule.

*Figures all more or less magnified.*

### 3. CYPRÆA.

From the rare occurrence of a new *Cypræa* it will not be a matter of surprise that no additional species were collected of this genus. Some observations were, however, made at Singapore on the Cowry in its early winged state, which it will be interesting to record, as confirming the following by Professor Edward Forbes in the Edinburgh Philosophical Journal, (vol. xxxvi. p. 326): "All Gasteropoda commence life under the same form, both of shell and animal, namely, a very simple spiral helicoid shell, and an animal furnished with two ciliated wings or lobes by which it can swim freely through the fluid in which it is contained. At this stage of the animal's existence, it corresponds to the permanent state of the *Pteropod*, and the form is alike, whether it be afterwards a shelled or a shell-less species."

While staying at Singapore I had an opportunity, in conjunction with Dr. Trail of that place, of observing the fry of *Cypræa annulus*, the species being then in spawn. Several specimens collected by us at low water were seen to have conglomerated masses of minute transparent shells (Pl. V. Fig. 4 *a, b, c*.) adhering to the mantle and other parts of the animal, which masses, when placed in a watch-glass of salt water, under the microscope, became disintegrated, and detached individuals were perceived quitting the rest, and moving in rapid gyrations, with abrupt jerking movements, by means of two rounded flattened alar membranous expansions, reminding one of the motions of some of the *Pteropods*. When at rest they joined the principal mass, or adhered, by means of their dilated expansions, to the surface of the watch-glass. Owing to the deficient powers of the microscope, I was precluded from making further observations, but a small mass of these objects was brought home and is represented in the plate above referred to.

While crossing the Mindoro Sea in calm weather, masses composed of many hundred individuals were obtained of similarly formed young shells, which were believed to be the young of two species of *Dolium*, some being smooth and some hairy. These clung chiefly to floating masses. *A.A.*

The minute helicoid shell of the young Cowry forms the nucleus of that which afterwards grows and undergoes several changes in form, gradually becoming more and more complicated until the outer lip is inflected and at length denticulated. The converse of this would appear, however, to take place in other *Gasteropoda*, as shown in the development of *Doris*, *Aplysia*, *Tritonia*, and others, where the shell at first turbinated and nautiloid in shape, afterwards becomes a merely internal rudimentary plate or altogether disappears.

On placing the young of *Cypræa* in a watch-glass of sea-water they may be seen to whirl about like the *Hyalæa* and *Cleodora*, and, like *Atlanta*, to adhere when fatigued to foreign bodies, not by any disc, but by means of the dilated expansions of their mantle. In the course of growth these fleshy expansions become entirely absorbed and do not ultimately constitute the lobes of the mantle which embrace and partially cover the shell in the adult. It would be interesting to observe the transitions in the figure of the animal and shell throughout the entire series of Mollusca; many phases exhibited in their metamorphoses would throw new light, not only on the identity of species, but on the reality of the existence of certain genera.

Of the rarer species of *Cypræa*, the *C. subviridis* and *pyriformis* were collected at Unsang, east coast of Borneo, on coral reefs; *C. flaveola* at Ambolan, eastern extremity of the Island of Mindoro, Philippines, from a sandy and weedy bottom in shallow water; and the small banded variety of *C. Humphreysii* at the Island of Gilolo, under stones on a reef; an enormous specimen of the white variety of *C. gangrenosa* was also taken from the coral flats at the Island of Panagatan. The most important addition to the genus consisted of some fine specimens of the *C. producta*, described by Mr. Gaskoin in the Proceedings of the Zoological Society for 1835, from a single worn specimen, of which no other example had been seen. They were collected at Unsang, east coast of Borneo, on the coral reefs, together with specimens of *C. rubinicolor*, of the same author, of almost equal rarity. The following are the principal observations upon the living animal *in situ*.

Although I have examined hundreds of *Cypræa tigris* in a living state, I never saw those changes of colour in the mantle of the animal described by Mr. S. Stutchbury in the Zoological Journal, who moreover states that they crawl about usually exposed to the sun, while the result of my experience would lead me to believe that they almost invariably lurk in holes of rocks, or under loose stones and among branching coral.

The soft parts of the different species of *Cypræa* vary considerably in colour, the animal of *Cypræa carneola*, for example, is of a beautiful red colour with the foot and mantle covered with numerous opaque oval white spots; that of *C. Talpa* is of a pale brownish black, with minute whitish specks; that of *C. caput-serpentis* is of a rich green brown; and in *C. lynx* the mantle is covered with numerous tufts of various forms, nodulous, trifid, or ending in two short processes; that of *C. Mauritiana* has conical tubercles, of *C. erosa* (Plate V. Fig. 6) numerous, rather long, branching, arborescent appendages; of *C. moneta* with



but few, and those chiefly around the free upper edge of the mantle; while in some these processes are altogether wanting.

In *Cypræa erosa* (Pl. V. Fig. 6) the siphon is of a dirty white colour; the tentacles orange; the eyes black; the mantle brown, covered with small dark spots; the foot white, with black reticulated markings.

In *Cypræa caurica* (Pl. V. Fig. 5) the mantle is light brown, perfectly smooth, and covered with dark brown reticulations; the foot is brown, with minute white spots; the peduncle of the eye is of a brilliant white; the head is brown; the base of the tentacles dull white; the tentacles beyond the eyes light brown.

In Quoy's figure of *Cypræa Isabella* (Voy. Astrol. t. 48. f. 15) the edge of the mantle is simply lobed, and the remainder of the surface naked and void of appendages. In the animal of *C. caurica*, the edge of the mantle forms a continuous slightly-waved line, and the surface covering the shell is perfectly smooth, with the delicate anastomosing lines mentioned above. *A. A.*

#### 4. ERATO, *Risso*.

1. ERATO CALLOSA. Pl. X. Fig. 32 *a, b*. Erat. testâ pyriformi, crassâ, tumidâ, callosâ, spirâ breviusculâ, subobtusâ, columellâ excavatâ, labro conspicuè denticulato; carneâ, subtus albicante.

HAB. China Sea.

An interesting species of rather large size, distinguished by its callous, thickly-enamelled growth.

#### 2. COLUMELLATA.

A considerable number of species of *Mitra* were collected, but as in the case of the Cones, nearly all had been described and figured in the 'Conchologia Iconica,' chiefly from the researches of Mr. Cuming in the same locality. An important accession was made to the genus *Voluta* by the discovery of the first recent analogue of a well-known fossil type, abounding in the Eocene portion of the Tertiary beds of the Isle of Wight, dredged at the depth of a hundred and thirty-two fathoms off the Cape of Good Hope; and some interesting species of *Marginella* were procured, with the animal in a living state, of which drawings were made.

#### 5. VOLUTA, *Linnaeus*.

1. VOLUTA ABYSSICOLA. Pl. VII. Fig. 6 *a, b, c, d*. Vol. testâ pyriformi, tenui, spirâ brevi, sub-turritâ, apice acutâ, anfractibus supernè depresso-caniculatis, liris numerosis, acutis, longitudinalibus et transversis undique creberrimè subprofundè cancellatis, liris supernè mucronatis, columellâ quadriplicatâ, aperturâ subangustâ, labro tenui; fulvescente-cinereâ, fasciis rufo-fuscis angustis tribus vel quatuor cingulatâ.

HAB. Cape of Good Hope.

This elaborately carved species is one of considerable interest in a geological point of view, from the circumstance of its being the first living representative yet discovered of a group of highly sculptured Volutes abounding in the Eocene portion of the Tertiary beds of the British Isles. The principal of these, *V. lima*, *elevata*, *crenulata*, and *digitalina*, were distinguished by Mr. Swainson as a subgenus, under the name *Volutilithes*. The *Voluta abyssicola* is not identical in species with the fossils, being characterized by a closer and more sharply-defined pattern of lattice-work, which comprises as many as thirty transverse, and forty longitudinal, ridges in a whorl. The upper edge of the whorls is depressly flattened at the sutures, forming a narrow ascending canal. The ridges are slightly nodulous at the point of crossing, and round the upper extremity impart a coronated aspect to the shell. The columellar plaits, four in number, are sharp and delicate. The outer lip is thin, and does not appear to be mature. The only specimen collected was dredged from a bank of dead shells and rounded iron-stones, at the depth of 132 fathoms.

#### 6. MITRA, *Lamarck*.

The animal of *Mitra* has in general a very short foot, straight and continuous from side to side in some species, but in others notched, and produced, with a thickened anterior margin. It is commonly narrow and rounded, or acuminate posteriorly, and it bears a very small semi-transparent horny operculum, in some instances scarcely visible. The siphon is mostly directed forwards, and the somewhat short tapering tentacles have the eyes either situated about half-way, or they are placed on the outer side of the base. The head is long and very flat, and the tentacles are very close together at their bases. The proboscis is rarely exerted when they are crawling and lively, but as they become languid after capture it becomes distended with water and protrudes considerably.

1. MITRA RUFILIRATA. Pl. X. Fig. 26. Mitr. testâ ovato-fusiformi, spirâ subcanaliculatâ, apice acutâ, transversim undique lirâtâ, litarum interstitiis creberrimè subtiliter clathratis, columellâ sexplicatâ, aperturâ longiusculâ, angustâ, labro simplici; virescente-albâ, liris lineis rufo-fuscis interruptis undique tinctâ, in medio subobscurè fasciatâ.

HAB. Chiua Sea.

The colouring is very characteristic in this species. The ridges are regularly stained throughout with interrupted red-brown lines, a profusion of which in the middle produces an obscure band.

2. MITRA SULUENSIS. Pl. X. Fig. 27. Mitr. fusiformi-turritâ, apice acutâ, anfractibus subrotundato-angulatis, undique longitudinaliter lirato-costatis, costarum interstitiis sulcato-clathratis, columellâ quadriplicatâ, aperturâ angustâ; fulvo, fusco, cæruleoque variè tinctâ, apice fusco.

HAB. Sooloo Islands.

Very closely allied to *M. cruentata*, from which it chiefly differs in its more slender fusiform growth.

3. *MITRA SEMISCUPTA*. Pl. X. Fig. 28. Mitr. testâ oblongo-fusiforimi, apice acutâ, anfractibus duodecim, posticis longitudinaliter costatis, costarum interstitiis sulcato-clathratis, anfractibus anticis lævigatis, columellâ tri-quadriplicatâ, aperturâ angustâ, labro simplici; plumbeâ, lineis tenuibus ferrugineis undulatis obscure pictâ, anfractu ultimo pallidè unifasciatâ, apice fusco.

HAB. Sooloo Islands; at a depth of about thirty fathoms.

All the specimens collected were of the same uniform lead-colour, the last and penultimate whorls being smooth, whilst the rest are highly sculptured.

4. *MITRA DICHROA*. Pl. X. Fig. 29. Mitr. testâ obeso-ovatâ, crassiusculâ, obliquè subobscure plicato-costatâ, columellâ subobscure triplicatâ; intensè cæruleo-nigro et albo transversim alternatim fasciatâ.

HAB. Philippine Islands.

Belonging to that obese section of the genus of which *M. lauta* and *leucodesma* are typical examples.

5. *MITRA RUBELLA*. Pl. X. Fig. 30. Mitr. testâ fusiformi-turritâ, anfractibus supernè tumidiusculis, infernè contractis, undique creberrimè clathratis, columellâ quadriplicatâ, basi subcontortâ et recurvâ; rubellâ.

HAB. Sooloo Islands.

Of a uniform, delicate rose-tint, and finely cancellated throughout, the whorls being swollen behind, and attenuated and recurved in front.

6. *MITRA INCISA*. Pl. X. Fig. 31. Mitr. testâ oblongo-ovatâ, apice acutâ, anfractibus angustè sulcatis, sulcis spiræ latioribus et crenulato-punctatis; sordidè luteo-albicante, anfractu ultimo anticè castaneo-rufescente.

HAB. China Sea.

Remarkable on account of the contrast between the sculpture and colouring of the front and hind part of the shell.

The Philippine Islands would seem to harbour the greatest number of these elegant and beautiful shells, although a great many species were obtained by Mr. Cuming in tropical America. They appear to be chiefly confined to the equatorial regions, scarcely any being natives of cold climates. I have met with several among the Meia-co-shima Islands, at Loo-Choo, at Japan, and at the Keeling or Cocos Islands. They are most frequently to be met with in somewhat shallow water among the ledges of rocks, between small islands where the water barely covers the land, and within the shelter of coral-reefs; sometimes preferring a clear sandy bottom, and sometimes affecting a hard muddy sandy soil. The transversely ribbed species are frequently found in very deep water, and many were dredged by us in twenty and thirty fathoms at Sooloo and in the China Sea.

The animal of *Mitra flammigera*, one of these deep-water species, is very prettily marked. The body is grey, varied with round, well-defined, white spots, and dark-brown blotches, of a pyramidal form, arranged in a row round the lower edge in a Vandyke pattern, and below that a white rim with a row of small, linear, horizontal, black spots; the head is white, marbled with grey-brown; the eyes black and the tentacles white, with a large, oval, black spot in their middle; the siphon is brown, edged with black, and with a broad white band at its free extremity. The operculum is very minute, horny, and transparent.—Caramata Passage; fourteen fathoms, hard muddy bottom, mixed with sand and broken shells.

Another species, with the same habits, the *Mitra interlirata*, is semiopaque, white, faintly mottled with light brown, with the eyes at the outer base of the tentacles and black.—China Sea; ten fathoms.

The animal of that division of the genus which Swainson included under *Conohelix* is the same as in the typical species. I have found the *Mitra Conus* buried rather deep in the soft black mud under the roots of trees in mangrove swamps, above high-water mark, in the Island of Basilan. The *M. conica* is found in company with other species of Mitres, crawling slowly over the sandy mud in shallow places, among the islands of the Philippine group.

Although M. Quoy has rightly termed the *Mitra* an "animale apathique," I have seen the small longitudinally-ribbed species crawl about pretty briskly over the smooth sand among the low coral islands. The *Mitra episcopalis*, probably on account of the small size of its locomotive disc, and the ponderous nature of its long shell, is a very sluggish mollusk. I have observed some of the *Auricula*-shaped Mitres that live among the Philippines, in the shallow pools left by the receding tide, crawling about the stones out of the water, in company with *Planaxis* and *Quoyia*. The Mitres, like many of the large *Volutes*, prefer, however, to associate together, and may be seen in dozens crawling over the sandy mud-flats in shallow water, being most active just as the flood-tide makes. When the tide recedes, they bury themselves superficially in the yielding soil, and are with difficulty discovered. Some of the small-ribbed species cover themselves entirely with the sandy mud, and in that disguised condition travel about with comparative security. On one occasion, on the small island of Ambolan at the south end of Mindoro, I was walking up to my ankles over a firm sandy mud-flat, taking little notice of the *Cones*, *Strombi*, *Meleagrinae*, and *Volutes*, which people the water in great numbers, but looking about anxiously for the rarer Mitres, when I first perceived these small species, under their ingenious disguise, marching in towards the shore as the tide flowed rapidly over the level surface. Persons, by the way, should never venture in places of this description barefooted, as there is a species of *Pinna* which buries its sharp end in the mud, but leaves the thin trenchant edges of the gaping extremity exposed, and, when trodden on, inflicts very deep and painful incised wounds. Both myself and several of the boat's crew suffered in this way. *A. A.*

## 7. MARGINELLA, Lamarck.

1. MARGINELLA DIADOCHUS. Pl. VII. Fig. 4 *a, b, c.* Marg. testâ oblongo-ovatâ, spirâ subpromiulâ, anfractibus quinque, supernè declivibus et tumidiusculis, columellâ quadriplicatâ, aperturâ subangustâ, labro vix incrassato; olivaceo-carneolâ, lineis nigris distantibus conspicuè subirregulariter cingulatâ.

HAB. Straits of Sunda; from a sandy floor at a depth of about three fathoms.

The animal of this beautiful species may be described as follows:—Tentacles yellowish, with a row of marbled crimson spots; eyes black and minute; mantle pale, semi-

transparent, pinkish-yellow, with a row of semioval crimson spots round the thin free edge, the remainder being covered with radiating linear spots and short waved lines of a crimson colour; siphon marbled with crimson; foot of a delicate yellowish-pink, marked with deep crimson rays. The shell is of a bright olive carnelian hue, conspicuously encircled at irregular intervals with broad black lines, having almost the consistency of bands.

2. MARGINELLA UNDULATA. Pl. VII. Fig. 5 *a, b, c.* Deshayes, Anim. sans vert. vol. x. p. 451. *Voluta glabella undulata*, Chemnitz, Conch. Cab. vol. x. pl. 150. f. 1423-4. *Voluta strigata*, Dillwyn. *Marginella strigata*, Kiener.

HAB. East Coast of Africa; from a sandy floor.

This fine species was also taken alive. The tentacles, siphon, foot, and mantle are of a delicate, semitransparent, yellowish ground colour, streaked and mottled with carmine, the border of the mantle being richly spotted with the same. The left lobe of the mantle is more produced over the shell than the right.

The tentacles of the *Marginellæ* appear to vary in different species. In those observed by M. Deshayes on the shores of the Mediterranean, the tentacles are described as being short, whilst in this and the preceding species they are slender and elongated. It may be remarked, too, that the eyes of the *Marginella diadochus* are more pedunculated than those of *M. undulata*.

3. MARGINELLA ONYCHINA. Pl. X. Fig. 25. Marg. testâ ovatâ, subobesâ, spirâ plano-depressâ, ferè occultâ, anfractibus supernè rotundato-tumidis, columellâ fortiter sexplicatâ, aperturâ elongatâ, labro incras-sato; albidâ, cinereo-griseâ, confertim promiscuè strigatâ, obscurè trifasciatâ, labro albo.

HAB. China Sea.

This species might be readily confounded with the *Marginella tricincta*, but it differs materially in form, being more depressed and rounded at the hinder extremity, with the spire buried as in the Cowries, and less swollen in the middle. The streaky character of the painting is also characteristic.

### 3. PURPURIFERA.

The *Purpurifera* are most abundant in the Eastern Seas, and were collected in great numbers; but, as monographs of the principal genera have been only lately published, little remained that was new. No *Columbellæ* were taken but what have been already figured in the 'Thesaurus Conchyliorum;' it has, however, been thought desirable to figure the living *C. fulgurans* and *semipunctata*, the habits of which afforded some observations. Five species of *Terebra*, differing from any of those described in Mr. Hinds' recent monograph of that genus, were collected, and a magnificent addition was made to the limited genus *Oniscia*.

## 8. TERE BRA.

1. *TEREBRA SEROTINA*. Pl. X. Fig. 20. Ter. testâ lanceolato-turritâ, basi breviter recurvâ, anfractibus planulatis, supernè plicato-nodulosis, deinde arcuatim liratis, liris striis transversis numerosis irregularibus decussatis; citrino-aurantiâ.

HAB. Japan Island, Nangasaki Bay.

The noded sculpture round the edge of the whorls, forming somewhat of a shelf, makes the sutures very distinct. The nodules are slightly plicate and pass into arched concentric ridges.

2. *TEREBRA ALBICOSTATA*. Pl. X. Fig. 21. Ter. testâ subulatâ, anfractibus supernè plicato-nodosis, deinde costatis, costis angustis, subirregularibus, interstitiis transversim impresso-striatis; castaneo-rufâ, costis nodisque albidis, anfractu ultimo basin versus albifasciato.

HAB. China Sea.

The ribs and nodules, although naturally white, appear colourless from the effect of abrasion.

3. *TEREBRA CÆLATA*. Pl. X. Fig. 22. Ter. testâ lanceolato-turritâ, anfractibus longitudinaliter arcuatim plicato-costatis, costis liris duplicatis striisque transversis cancellatis, sulco unico conspicuo infra suturas; albâ.

HAB. Philippine Islands.

The chief peculiarity of this delicately carved species consists in the transverse ridges being finely duplicate.

4. *TEREBRA AREOLATA*. Pl. X. Fig. 23. Ter. testâ lanceolato-turritâ, gracili, anfractibus planis, longitudinaliter plicato-costatis, costis tumidiusculis, confertis, subundulatis, interstitiis alveolatis; rubellâ, albo variegatâ.

HAB. China Sea.

The opake white marbling of the shell is mainly upon the ribs, which have a swollen appearance, and are unusually close-set.

5. *TEREBRA ROSEATA*. Pl. X. Fig. 24. Ter. testâ subulatâ, anfractibus plicato-costatis, costarum interstitiis liris tenuibus clathratis, sulco prominulo infra suturas; pallidè roseâ.

HAB. Sooloo Islands; from sandy mud, at a depth of about thirty fathoms.

Of a uniform, delicate, transparent, pink colour.

6. *TEREBRA TORQUATA*. Pl. X. Fig. 13. Ter. testâ lanceolato-turritâ, anfractibus concavis, arcuatim costatis, supernè biserialim, infrâ uniserialim, nodosis, transversim striatis; fusciscente-albâ, ferrugine marmoratâ.

HAB. China Sea.

The whorls of this species are concave and arcuately ribbed, the ribs being characterized by two rows of nodules at the upper part, and one below.

### 9. OLIVA, *Bruguère*.

1. OLIVA FULGURATA. Pl. X. Fig. 12. Oliv. testâ fusiformi, lævissimâ, nitente, spirâ acuminatâ, columellâ arcuatâ, parùm sulcatâ, truncatâ, aperturâ oblongâ, labro subdilatato; albidâ, castaneo longitudinaliter conspicuè fulguratâ, columellâ castaneo-rufo fasciatâ.

HAB. China Sea.

A highly polished shell, very conspicuously painted with longitudinal, zigzag, chestnut bands upon a whitish ground, the columella having a reddish tinge of colour.

### 10. ANCILLARIA, *Lamarck*.

The animal of *Ancillaria* is voluminous, covering the entire shell, with the exception of the spire. The head, which is entirely concealed by the reflected portions of the foot, consists of a short, inflated, cylindrical, annulated proboscis, above which is a semilunar veil formed by the dilatation and union of the tentacles; there is no indication of eyes. The mantle lines the shell, and is produced anteriorly into a long siphon. The foot is large and bursiform, the side-edges being greatly extended and reflected over the shell, meeting in the middle on the back. As in *Oliva*, it is deeply fissured anteriorly, forming a semilunar disc before the head, divided by a deep longitudinal groove into two lateral, triangular lobes, acuminate transversely; posteriorly it is bilobed, and is either without an operculum, or is provided with a thin, horny, unguiform one, with apical nucleus, semilunar striæ, and an oval muscular impression.

1. ANCILLARIA OBTUSA. Pl. XIII. Fig. 6 *a, b*. Swainson, *Journ. Sci. Lit. and Arts*, vol. xviii. p. 282. Sowerby, *Species Conchyliorum, Anc.* p. 5. Fig. 24, 25.

HAB. East coast of Africa, below Port Natal.

The specimen taken alive at the above-named locality was of a dirty white colour, marked with dull brown, elongated blotches, distributed with scarcely so much regularity as represented in our figure. Fig. 6 *b* represents the operculum.

The *Ancillariæ* resemble the *Olivæ* in their habits, dwelling among the smooth sands in which they frequently bury themselves. They crawl with a quick sliding motion, and, as they glide briskly along, the tubular cylindrical siphon only is visible, directed backwards and upwards, and even laid flat upon the back; the alar expansions of the foot slightly overlap each other in the middle, and, extending considerably beyond the spire, form posteriorly a loose open sac. It is possible that the dilated lobes of the foot are sometimes extended and serve for swimming, as D'Orbigny has observed in *Oliva Tehuelchana*, *Voy. Amér. Mérid. Moll.* p. 419. *A. A.*

11. EBURNA, *Lamarck*.

An interesting drawing was made of the living *Eburna areolata*, Lamarck, but no new species were collected of the genus. It agrees in all respects with the generic description of the animal given by M. Deshayes (*Anim. sans vert.* vol. x. p. 231), and is only inserted here for the sake of its specific characters.

1. EBURNA AREOLATA. Pl. VIII. Fig. 5. Lamarck, *Anim. sans vert.* vol. x. p. 235. *Eburna tessellata*, Swainson. Head flat, extended; tentacles very long and slender; eyes consisting of a yellow iris and black pupil mounted upon pedunculated swellings on the outer base of the tentacles; siphon large, fleshy and slightly curved; foot long, fleshy and robust, acuminated behind and carrying a horny operculum. Colour dull pinkish-white, sprinkled with large, light brown, irregular blotches; siphon and tentacles mottled with spots of the same colour.

HAB. China Sea; from mud at the depth of fourteen fathoms.

It is extremely rare to find any sort of concordance between the colouring of a mollusk and its shell. In the present instance there is a characteristic resemblance in this respect.

12. BUCCINUM, *Linnaeus*.

1. BUCCINUM HINNULUS. Pl. VII. Fig. 10 *a, b*. Bucc. testâ ovato-turbinatâ, ventricosâ, basi contortâ et recurvâ, anfractibus septem, transversim crebriliris, supernè angulato-declivibus, ad angulum exiliter nodulosus; albidâ, aurantio-fusco sparsim maculatâ et strigatâ.

HAB. Cagayan-Sooloo.

Closely encircled throughout with contiguous slightly convex ridges, promiscuously blotched with rich orange chestnut upon a white ground.

2. BUCCINUM CLATHRATUM. Pl. XI. Fig. 12. Bucc. testâ fusiformi-oblongâ, crassiusculâ, anfractibus septem, supernè tumidiusculis, liris longitudinalibus et transversis undique creberrimè clathratis, columellâ laminâ callosâ indutâ, aperturâ angustâ, labro incrassato, supernè vix sinuato; fuscescente-albâ, obscurè bi-trifasciatâ.

HAB. Cape of Good Hope; dredged from the depth of a hundred and thirty-six fathoms.

This interesting deep-water species, and that which follows, approximate to the form distinguished by Bivona as a genus under the name *Pisania*. It is of rather solid growth, very closely sculptured throughout with lattice-work.

3. BUCCINUM MITRELLA. Pl. XI. Fig. 13. Bucc. testâ angustè fusiformi, spirâ exsertâ, anfractibus octo, convexo-planis, lineis elevatis, longitudinaliter areuatis et transversis subtiliter cancellatis, aperturâ angustâ, brevisculâ, labro subincrassato, supernè vix sinuato; albâ, maculis subquadratis spadiceis obscurè tinetâ.

HAB. China Sea; from ten fathoms.



Characterized by the same idea of form and sculpture as the preceding species, though materially distinct in detail.

4. *BUCCINUM FILOSUM*. Pl. XI. Fig. 18. Bucc. testâ acuminato-oblongâ, crassiusculâ, spiræ suturis canaliculatis, anfractibus plano-convexis, lævibus, lincis incisibus subdistantibus transversim regulariter sulcatis, columellâ arcuatâ, peculiariter abbreviatâ et truncatâ, margine uniplicatâ, aperturâ anticè dilatâ, posticè submarginatâ; carneâ et cinerascens, sulcis alternis rufo-fuscescentibus maculisque obscure bifasciatâ.

HAB. China Sea.

This shell, which is remarkably characterized by the abrupt truncature of the columella, and by its anteriorly dilated aperture, might possibly belong to an animal generically distinct from *Buccinum*. If such should prove hereafter to be the case, we propose to regard the species as the type of a new genus, with the name *Truncaria*.

5. *BUCCINUM ALBIPUNCTATUM*. Pl. XI. Fig. 21. Bucc. testâ acuminato-ovatâ, anfractibus septem, tribus obliquè plicatis, cæteris lævibus, nitentibus, ad suturas subtiliter marginatis, aperturâ parviusculâ, labro subincrassato, limbo spinoso-crenulato, supernè sinuato; pallidè fulvescente, punctis minutis opaco-albis seriatim notatâ, apice rosaceo.

HAB. Island of Mindanao, Philippines; on the shore.

*B. albipunctatum* belongs to that section of the genus distinguished by Mr. Gray with the title of *Northia*, of which *B. pristis* is the type; and it is very closely allied to a species improperly referred in the 'Conchologia Iconica' to the genus *Pleurotoma*, Sp. 111, *P. Rissoides*.

### 13. CYLLENE, *Gray*.

1. *CYLLENE LUGUBRIS*. Pl. X. Fig. 10. Cyll. testâ ovatâ, crassâ, spirâ acutâ, anfractibus undique creberrimè sulcatis, supernè tumidis, subtiliter noduloso-plicatis; intensè castaneâ, labro albo, anfractuum margine superiore albivarietatâ.

HAB. Sooloo Islands.

A fine stout species of this characteristic, but little known, genus, in which the whorls are finely nodulously plicated round the upper part.

2. *CYLLENE PULCHELLA*. Pl. X. Fig. 11. Cyll. testâ ovatâ, crassiusculâ, spirâ subacuminatâ, acutâ, anfractibus medio tumidis, transversim lincari-sulcatis, apicem versus subtilissimè plicatis; albâ, flammis pallidè rosaceis obscure variegatâ, apice roseo.

HAB. Borneo; on the shore.

An extremely delicately painted species, with light pink waves, and pink apex.

### 14. PURPURA, *Lamarck*.

1. *PURPURA CUSPIDATA*. Pl. XI. Fig. 35. Purp. testâ abbreviato-ovatâ, spirâ brevi, acutâ, anfrac-

tibus supernè coneavis, infrà quadriliratis, liris duabus superioribus eompresso-squamatis, squamis supremis grandibus, erectis, spinosis ; nigricante-fuscâ, liris quatuor albis, aperturæ fauce æeruleseente-albâ.

HAB. China Sea.

Several examples of this species, differing materially from any hitherto described, were collected in the China Sea, with scarcely any variation of form or colouring.

### 15. COLUMBELLA, *Lamarck*.

The animal of *Columbella* has a long and somewhat narrow vertically depressed head, with the eyes sometimes placed on the outer side of the base of the tentacles, and sometimes on the outer side of reflected prominences, situated at some little distance from the head. The siphon, long and directed forwards, is considerably dilated at the anterior extremity. The foot is short and pointed posteriorly, and bears a small, semitransparent, horny operculum, with concentric elements. Anteriorly the foot is often considerably produced beyond the head, where it forms a long, thick, flattened, fleshy, finger-like process. Sometimes it is expanded laterally, when it is truncate anteriorly and furnished with two lateral angular processes.

1. COLUMBELLA TÆNIATA. Pl. XI. Fig. 19. Col. testâ fusiformi-ovatâ, anfractibus plano-convexis, lævibus, nitentibus, aperturâ parvâ, labro incrassato, supernè sinuato ; rufeseente-carneâ, maculis quadratis rufo-fuscis tæniatâ.

HAB. Borneo.

There are two fillets of square red-brown spots on each whorl, the lower of which is concealed in all but the last whorl.

2. COLUMBELLA SEMIPUNCTATA. Pl. XIII. Fig. 7. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. x. p. 267.

HAB. Shores of Borneo.

The animal of this species has a white head, marked with a series of large orange blotches on the upper surface ; the siphon is of a deep orange colour at the anterior extremity, and is ornamented with two rows of large, oval, orange spots, placed alternately with each other. The eyes are black ; the tentacles are dead white, and deep orange at their distal extremities ; the body is handsomely marbled with orange and yellow, the latter colour forming a loose open net-work, with irregular, lozenge-shaped meshes.

3. COLUMBELLA FULGURANS. Pl. XVII. Fig. 8. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. x. p. 272.

HAB. From the shingly beach of a small islet off Billiton.

The animal of *Columbella fulgurans* has the head white, covered with large, black, oval

spots; the tentacles pure white; the siphon elegantly annulated with alternate, broad, black and white rings, the white rings being much narrower than the black; the foot is of a clear dead white, covered with large, black, somewhat scattered, oval spots.

The *Columbellæ* live in shallow water, some species crawling on the surface of sand-flats, and some affecting stony beaches, where they congregate about the stones in considerable numbers. *C. varia*, observed in plenty at the Island of Billiton, on a coral and stony bottom, is of a pure dead white; the body, head, and foot being covered with large, oval, black blotches, and the tentacles marked with a row of black spots along their entire length. The siphon is annulated alternately with brown and white. *A. A.*

#### 16. ONISCIA, *Sowerby*.

1. ONISCIA EXQUISITA. Pl. V. Fig. 3 *a, b*. Onisc. testâ subtrigono-ovatâ, basi obtusè recurvâ, spirâ brevi, acutâ, anfractibus octo, supernè concavo-depressis, tuberculis papillaribus undique angulatis, lirâ subobscurâ interveniente, labro columellari latè expanso, granulis valdè irregularibus, labro externo incrassatim reflexo, liris brevibus dentiformibus irregulariter munito; albidâ, aurantio-fusco hic illic sparsim punctatâ, et pone labrum trimaculatâ, labris pallidè purpureo-rosaceis, apice rufo.

HAB. Sooloo Archipelago; outside a coral reef near the city of Sooloo, in about sixteen to twenty fathoms, sandy mud.

The surface of this very chaste and delicate *Oniscia* is covered with papillary tubercles, in rows of about ten either way, transversely or longitudinally. The columella and outer lips are enamelled of a livid purplish-pink colour.

#### 4. ALATA.

#### 17. STROMBUS, *Linnaeus*.

1. STROMBUS CORRUGATUS. Pl. X. Fig. 19. Stromb. testâ fusiformi-turritâ, anfractibus novem, transversim undique creberrimè liratis, supernè rotundato-angulatis, ad angulum plicato-costatis, costis subcorrugatis, in anfractu ultimo gradatim distantioribus et majoribus, tubercula formantibus, aperturâ subangustâ, labro columellari calloso, externo ponè incrassato; albâ, fulvo-castaneo subirregulariter fasciatâ, aperturæ fauce albâ.

HAB. Korea.

Distinguished by its corrugated ribs, which in the last whorl gradually pass into tubercles, larger, and at more distant intervals.

#### 18. ROSTELLARIA, *Lamarck*.

1. ROSTELLARIA RECTIROSTRIS. Pl. V. Fig. 2 *a, b, c*. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. ix. p. 655.

HAB. Coast of Borneo; dredged from black sandy mud at the depth of thirty-one fathoms.

Animal with a subcylindrical annular proboscis, coloured by a broad, central, dark

bronze line, the edges of which are yellow, bordered with vermilion; eyes deep blue, with black pupils, surmounted on long cylindrical peduncles; tentacles white, with a narrow vermilion streak along their anterior surface; body cylindrical and much elongated, marked with red-brown on the outer surface, white beneath; foot narrow, rather dilated and rounded in front, with a thickened anterior margin, small and subquadrate behind, the two portions separated by a deep notch; operculum ovate-triangular, annular, horny, semitransparent.

The *R. rectirostris*, like the rest of the *Alata*, progresses by bending the foot under the shell and suddenly straightening, which enables it to roll and leap over and over. It is extremely timid in this respect, unlike *R. fissa*, of which the animal is light brown varied with lighter markings of the same colour.

### 19. TEREHELLUM, *Klein*.

The discovery of the living *Terebellum* has occasioned the removal of that genus to this family, on account of its affinity with *Strombus*. The eyes are pedunculated, and the mantle is characterized by the same peculiar divided edge. In the narrow form of the foot and proboscis-like head it is allied to *Struthiolaria* and *Aporrhais*, and, like *Oliva*, the mantle has a long filamentary cord winding into the sutures of the shell.

1. TEREHELLUM SUBULATUM. Pl. IX. Fig. 6. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. x. p. 584.

HAB. China and Sooloo Archipelago.

The animal of *Terebellum* may be thus described:—Head probosciform; tentacles connate with the long cylindrical eye-peduncles, at the ends of which are placed the eyes; mantle with the right edge reflexed over the outer lip, produced in front into a short siphon, and furnished behind with three or four filaments, the inner edge spread over the columella and ending behind in a long slender filament, which occupies, as in *Oliva*, the channelled suture of the spire; foot large, ovate, fleshy, laterally compressed, with a lobe at the fore part, rounded behind, and bearing a minute, horny, triangular operculum.

The eye-peduncles of this species are finely dotted with brown, the proboscis and the fore part of the body is punctulated with the same; the rest of the body is opaque white, with three large irregularly-shaped red-brown blotches on the fore part; the under-surface of the foot is light brown, with a white subcruciate marking.

The *Terebellum* is extremely shy in its movements. Poising its shell in a vertical position, and cautiously protruding its longest telescope-eye from the truncature in the front of the shell, it will remain stationary until assured of security. It will then use its pointed foot as a lever and roll its shell over and over, progressing by a series of irregular leaps. When removed from the water before dying, it will jump several inches from the ground. Mr. Cuming assures me his knowledge of the animal coincides with my own experience, and that on one occasion he lost a fine specimen owing to its suddenly leaping from his

hand into the water. I have observed both the varieties of this species alive. In the spotted variety, the muzzle is reddish towards the tip, the body is opaque pearly white, the eye-peduncles mottled with dark red; in the common variety there are three large red-brown blotches on the fore part of the body, and the under surface of the foot is light brown with a cross-like mark of darker brown. *A. A.*

## 20. TRITON, *De Montford.*

1. TRITON TESTUDINARIUS. Pl. IX. Fig. 3 *a, b.* Trit. testâ trigono-fusiforâ, longicaudatâ, varicibus senis septemve, spirâ obtuso-elongatâ, anfractibus supernè concavo-declivibus, transversim noduloso-costatis, et tuberculatis, tuberculis grandibus, costis super varices duplicatis, aperturâ parviusculâ, labro intus fortiter tuberculato-dentato; rufescente-fuscâ, columellâ intensè rufo-purpureâ, albirugosâ.

HAB. China Sea.

An interesting species, having the form of *T. tripus*, with the colouring of *T. cynocephalus*, which is always well characterized by the deep purple colouring of the columella.

2. TRITON PYRULUM. Pl. X. Fig. 17. Trit. testâ clavæformi, longicaudatâ, varice unicâ, anfractibus supernè declivibus et rotundatis, transversim subtiliter crenato-liratis et multinodatis; albidâ, fuscescente hic illic pallidè tinctâ.

HAB. Eastern Seas.

Very like *T. canaliculatus*, except that the spire is not canaliculated.

3. TRITON MONILIFER. <sup>Pl. X, Fig. 18 [ex Index]</sup> Trit. testâ clavato-pyriformi, varice unicâ, anfractibus supernè angulatis, liris crenatis subdistantibus cingulatis, ad angulum acutè plicato-nodosi, labro columellari subincrassato, aperturâ ovali, intus corrugato-dentatâ; albidâ, varicibus rufo-fusco tessellatis.

HAB. Eastern Seas.

Distinguished by its pyriform growth, and general detail of sculpture.

## 21. RANELLA, *Lamarck.*

In *Ranella* the tentacles are commonly somewhat closer together than in *Triton*, and the head is longer and narrower than in *Murex* and *Fusus*; the eyes in some species are nearly basal, but are generally placed about the middle of the tentacles on their outer sides; the siphon is short and directed upwards, the foot larger than in *Triton*, *Murex*, or *Fusus*, and considerably dilated both before and behind; the mantle does not appear to be furnished with fimbriated processes as seen in some Murices. In some species the trunk is enormously developed, whereas in others it is not protruded in the usual condition of the animal. In colour the *Ranellæ* are usually of a pale brown, marbled and mottled with deeper brown. The operculum is ovate, horny, with a lateral nucleus and semicircular elements.

1. RANELLA ALBIVARICOSA. Pl. XIII. Fig. 4. Reeve, Conch. Icon. *Ranella*, pl. 1. f. 2. The animal

of this species is white, faintly marbled with grey; the eyes are black, and there is a dark transverse band across the middle of each tentacle. Operculum horny, semicircular, with the lines of growth distant.

HAB. Java Sea.

The *Ranella* is by no means an inactive animal, but moves with considerable animation, thrusting out its head, dilating its foot, and protruding its tentacles and sometimes its proboscis with much vivacity; it will even crawl with considerable facility up perpendicular surfaces, supporting its somewhat weighty shell with comparative ease. In a species dredged from twenty fathoms in the Java Sea, the very long extensile proboscis was exerted to the distance of three inches from the head, and the animal appeared to employ it as an exploring organ, moving it about in all directions.

## 22. MUREX, *Linnaeus*.

1. MUREX EURYPTERON. Pl. VIII. Fig. 1 *a, b*. Reeve, Conch. Icon. *Murex*, pl. 34. f. 176.

HAB. Japan.

The shell here figured is only the second specimen yet discovered of this fine species, and is remarkable for its elegant growth.

2. MUREX RORIFLUUS. Pl. VIII. Fig. 2 *a, b*. Mur. testâ fusiformi, subventricosâ, anfractibus transversim obscurè liratis, rugosis, quadrivariosis, varicibus rudibus, simplicibus, planulatis, obscurè denticulatis, aperturæ margine dentato; sordidè cinerascente, intus nigricante-castaneâ, varicibus albidis.

HAB. Korean Archipelago.

Chiefly distinguished by the simple character of the varices.

3. MUREX FLORATOR. Pl. VIII. Fig. 3 *a, b*. Mur. testâ trigono-ovatâ, anfractibus lævibus, trivariosis, varicibus compresso-alatis, aperturâ parvâ, rotundatâ, canali clauso; castaneo-fuscâ, medio transversim albizonatâ.

HAB. Korean Archipelago.

This shell is somewhat worn, but two or three specimens were collected, all having the same characteristic form and dark chestnut colouring.

4. MUREX BURNETTI. Pl. VIII. Fig. 4 *a, b*. Mur. testâ trigono-ovatâ, crassiusculâ, anfractibus transversim obsoletè costatis, trivariosis, varicibus latè fimbriatis, dente unico marginali prominente, aperturâ ovali, canali clauso; albidâ, castaneo-fusco plus minusve tinctâ.

HAB. Korean Archipelago.

Another species from the same locality, of which two or three specimens were collected in worn and broken condition. Each varix is furnished with a prominent tooth, the outer varix being finely winged. The canal of the shell is closed over. We have the pleasure to name this fine species in honour of Sir William Burnett, F.R.S.

23. FICULA, *Swainson*.

Head elongated, slender, flattened; tentacles long, subulate, placed at the sides of the front, separated by a wide interval at their base; eyes large, black, and sessile on the outer side of the base of the tentacles; siphon elongated, subcylindrical, and produced; mantle thin and membranous, produced on each side into a rounded lobe equally reflexed on each side over the shell; foot large, expanded, rounded in front, rather produced on each side of the front edge, expanded, broad and tapering, and not furnished with any operculum.

1. FICULA LEVIGATA. Pl. IX. Fig. 4. Reeve, Conch. Icon. *Ficula*, pl. 1. f. 4. *Bulla ficus*, Linnæus. *Pyrula ficus*, Lamarck. Head and neck pink, varied with scattered yellow spots, mantle bright pink, mottled with white and darker pink; under surface of foot dark purple chocolate, varied with yellow scattered spots.

HAB. Sooloo Sea, at the depth of thirty-five fathoms.

The dark chocolate colouring of the under surface of the foot presents a rich contrast with the bright freckled pink of the upper.

2. FICULA RETICULATA. Pl. IX. Fig. 5. Reeve, Conch. Icon. *Ficula*, pl. 1. f. 1. *Pyrula reticulata*, Lamarck. Head and tentacles white, mantle light pink, marbled and reticulated with darker pink; foot pink, with six large opaque white spots at about equal distances.

HAB. West coast of Borneo; from mud at a depth of about seventeen fathoms.

The head of this species differs from that of the former in being colourless. The mantle is characterized by the same pink reticulated marbling as the foot.

The *Ficula* is a very lively animal when observed in its native element, crawling along with considerable velocity, and, owing probably to the lightness of its shell, able to ascend the sides of a glass vessel, in which I had it captive, with facility. The proboscis is rarely exerted when the animal is in motion, but the long slender tentacles are stretched out to their full extent. *A. A.*

24. PLEUROTOMA, *Lamarck*.

The animal of *Pleurotoma* has rather a short flattened body, with the foot notched in front, and the two angles produced on the sides; the posterior part is rounded and bears a small, semitransparent, horny operculum, with concentric elements. The head is very long, flattened, and but little produced in front; the tentacles are subulate and close together at the base, and the eyes are near the outer side of the tip, which latter tapers off beyond them.

The *Pleurotomæ* generally inhabit deep water and crawl rather quickly.

1. PLEUROTOMA IMPAGES. Pl. IX. Fig. 1 *a, b*. Pleur. testâ clavato-turritâ, solidiusculâ, anfractibus novem ad decem, medio tumidiusculis, concentricè obscurè plicato-rugatis, canali brevissimo, truncato, aperturâ oblongâ, labro leviter emarginato; albidâ, carneo-fuscescente suffusâ, inter rugas saturatiore.

HAB. China Sea.

A solid, club-shaped shell, in which the surface is slightly disposed in concentric folds.

2. *PLEUROTOMA FAGINA*. Pl. IX. Fig. 2 *a, b*. Pleur. testâ elongato-fusiforâ, solidâ, anfractibus quatuordecim, supernè depresso-cauliculis, infra spiraliter costatis, costis planiconvexis, interstitiis impresso-striatis, columellâ basi umbilicatâ, labri sinu profundo.

HAB. China Sea.

Of solid fusiform growth, strongly spirally ribbed and deeply channelled.

3. *PLEUROTOMA LURIDA*. Pl. X. Fig. 5. Pleur. testâ gracili-fusiforâ, anfractibus decem, transversim subtiliter striatis, supernè concavo-angulatis, ad angulum plicato-nodosis et transversim obtusè costatis, sinu subamplo; ferrugineo-fuscâ, infra angulum albidâ.

HAB. China Sea.

A shell of light substance, in which the sculpture is of a tremulous or corrugate character.

4. *PLEUROTOMA ALBICINCTA*. Pl. X. Fig. 6. Pleur. testâ subabbreviato-fusiforâ, anfractibus decem, transversim subtiliter striatis, supernè concavo-declivibus, deinde obliquè plicato-nodatis, sinu latiusculo; fulvescente, saturatè variegatâ, medio albizonatâ.

HAB. China Sea.

The white zone passes over the nodules upon the angle in the centre of each whorl.

5. *PLEUROTOMA LEUCOTROPIS*. Pl. X. Fig. 7. Pleur. testâ fusiformi, medio subobesâ, solidiusculâ, anfractibus undecim, levibus vel tenuissimè striatis, superuè concavis, deinde acutè carinatis, anfractu ultimo inferuè bicarinato, sinu peramplo; ustulato-fuscâ, carinâ albidâ.

HAB. China Sea.

Distinguished by the broad slanting concavity round the upper part of the whorls, and prominent central keel.

6. *PLEUROTOMA COREANICA*. Pl. X. Fig. 8. Pleur. testâ fusiformi, canali breviusculo, anfractibus novem, supernè concavis, deinde exiliter obliquè nodulosis, sinu peramplo, profundo; cereo-albâ, fasciâ latâ fuscâ infernè cingulatâ.

HAB. Korea.

A very characteristic species, of a wax-white aspect, encircled round the lower part of the last whorl with a broad brown band.

7. *PLEUROTOMA GRIFFITHII*. Pl. XIII. Fig. 13. Gray, Reeve Conch. Icon. *Pleurotoma*, pl. 7. f. 57. Body without any kind of marking, of a semi-opaque white, with the eyes black.

HAB. Java Sea; from a muddy stony bottom, at the depth of fourteen fathoms.

There is little of painting in the shell, and none in the animal.



25. MANGELIA, *Leach*.

1. MANGELIA TRIVITTATA. Pl. X. Fig. 9. Mang. testâ subtrigono-fusiforimi, spirâ breviusculâ, acutâ, anfractibus supernè angulatis, longitudinaliter costatis, costis ad angulum nodulosis, interstitiis concavis, transversim sub lente subtilissimè striatis; albidâ, rufescente pallidè trivittatâ.

HAB. Island of Mindoro, Philippines.

This appears to be distinct from any of the many pretty species of *Mangelia* collected by Mr. Cuming in the same locality, and described in the 'Conchologia Iconica.'

26. FUSUS, *Lamarck*.

1. FUSUS GRACILLIMUS. Pl. VII. Fig. 1. Fus. testâ gracillimo-fusiforimi, undique spiraliter sulcatâ et lirâtâ, anfractibus rotundatis, longitudinaliter plicato-costatis, costis latiusculis, medio unicarinatis, labrum versus evanidis; castaneo-fuscescente.

HAB. Eastern Seas.

Nearest allied to the *F. longicaudatus*, from which it may be readily distinguished.

2. FUSUS SPECTRUM. Fus. testâ elongato-fusiforimi, anfractibus convexis, transversim subtilissimè striatis, longitudinaliter tuberculatis, tuberculis apicem versus fortioribus, valdè conspicuis, anfractibus ultimi ferè evanidis, nisi in carinam acutè compressam; albâ, epidermide tenui lutescente indutâ.

HAB. Eastern Seas.

The rib-like tubercles of this species are developed with great force in all except the last whorl, in which they are merely represented by a compressed keel.

3. FUSUS ACUS. Pl. VII. Fig. 3 *a, b*. Fus. testâ lanceolato-fusiforimi, gracillimi, solidiusculâ, anfractibus longitudinaliter plicato-costatis, spiraliter sulcatis, sulcis subtilibus, confertis, peculiariter plano-excavatis, aperturâ parvâ, canali ferè clauso; rufo-ferrugineâ.

HAB. China Sea, off Borneo.

A narrow lanceolate shell, of a solid, constricted growth.

27. CANCELLARIA, *Lamarck*.

1. CANCELLARIA MACROSPIRA. Pl. X. Fig. 2. Canc. testâ acuminato-turritâ, solidiusculâ, vix umbilicatâ, spirâ valdè exsertâ, suturis plano-excavatis, anfractibus octo, convexis, apicem versus plicato-costatis, hic illic undique obscure varicosis, liris tenuibus longitudinalibus et transversis, subobsoletè crenulatis, eximiè clathratis, columellâ tenuiter triplicatâ, aperturâ parvâ, labro incrassatim varicoso, supernè producto; cereo-albicante.

HAB. Coast of Borneo, China Sea.

Remarkably distinguished from any species hitherto described by the elongated convolution of the spire.

2. *CANCELLARIA SEMIPELLUCIDA*. Pl. X. Fig. 3 and 3 a. Canc. testâ ovato-ventricosâ, tenuiculâ, vix umbilicatâ, spirâ breviusculâ, suturis profundè impressis, anfractibus quinque, supernè rotundatis, longitudinaliter obliquè plicato-costatis, liris transversis, costas super nodulosas, subobsoletè decussatis, columellâ triplicatâ, aperturâ ovatâ, effusâ, labro simplici; fuscescente-albâ, semipellucidâ.

HAB. Sooloo Sea.

A light inflated shell, with the sutures rather deeply channelled.

3. *CANCELLARIA LYRATA*. Pl. X. Fig. 4. Canc. testâ acuminato-ovatâ, umbilicatâ, spiræ suturis profundè impressis, anfractibus sex ad septem, subangustis, rotundatis, prominentibus, longitudinaliter costatis, costis elevatis, compressis, distantibus, e suturis descendentibus, liris tenuibus transversim regulariter sculptis, lineâ elevatâ interveniente, columellâ triplicatâ, plicâ anticâ subobsoletâ, aperturâ trigono-ovatâ, parvâ, subeffusâ; albicante, costis pallidè fuscescentibus.

HAB. China Sea.

The sculpture of this species, under the lens, is extremely characteristic.

4. *CANCELLARIA PYRUM*. Pl. X. Fig. 16. Canc. testâ ovato-pyriformi, solidâ, spirâ brevissimâ, parum exsertâ, anfractibus quinque, apicem versus clathratis, anfractu ultimo lævigato, granoso-corrugato, supernè calloso, columellâ triplicatâ, plicâ posticâ prominulâ, acutâ, anticâ obsoletâ, aperturâ oblongâ, subamplâ; sordidè albâ, epidermide corneâ fuscâ indutâ, columellâ et aperturæ fauce luteo-aurantiis.

HAB. China Sea.

A fine solid bulbous species, richly enamelled about the aperture.

## 28. *TURBINELLA*, *Lamarck*.

1. *TURBINELLA BELCHERI*. Pl. VII. Fig. 7 a, b. Turb. testâ fusiformi, spirâ subturritâ, anfractibus transversim subtiliter striatis, supernè concavis, medio ventricosis, serie duplici tuberculorum, deinde serie nodulorum cinctis; aperturæ fauce striatâ; albâ, maculis flammisque nigris conspicuè pictâ, epidermide luteâ indutâ.

HAB. Cargados Garajos, Indian Ocean (coral bottom).

This very beautiful new species, which we have the pleasure to dedicate to the Commander of the Expedition, is remarkable for its bold and characteristic painting.

2. *TURBINELLA LANCEOLATA*. Pl. VII. Fig. 8. Turb. testâ lanceolato-fusiformi, hexagonali, lævigatâ, basin versus rudè lirâtâ, anfractibus tuberculis grandibus costæformibus continuis undique longitudinaliter decussatis; aperturæ fauce tenuistriatâ; luteo-fuscescente, aperturâ vividè violacæâ.

HAB. Philippine Islands.

Distinguished from its nearest ally, *T. nodata*, in being of a more sharply lanceolate growth, whilst the whorls are less rounded, and the ribs, following continuously one beneath the other, impart a hexagonal form to the shell. The aperture, which in *T. nodata* is pink, in the present species is of a deep violet.

3. *TURBINELLA PICTA*. Pl. VII. Fig. 9. Turb. testâ ovato-fusiforâ, medio ventricosâ, anfractibus transversim sulcatis, longitudinaliter obtusè plicato-costatis, supernè concavis, deinde tuberculis compressis, quorum supremis majoribus cingulatis; aperturæ fauce striatâ; albâ, maculis numerosis nigricante-fuscis, lineisque transversis coccineis et luteis pulcherrimè pictâ, columellâ fusco-rosaceâ.

HAB. Feejee Islands.

A pretty species, of rather solid growth, extremely richly painted.

The animal of *Turbinella cornigera* is of a deep purple, finely marbled with white, the colours being fainter towards the margin of the foot. The eye is distinct and well formed, having a black pupil and iris of a light yellow colour. It crawls with deliberation and with apparent difficulty, appearing to labour under the weight of its heavy shell as a tortoise does under that of its carapace. It is, moreover, of a very timid disposition; shrinking also, like a tortoise, quickly within its shell on the slightest alarm. The specimen from which the foregoing observations were taken, was procured in about a fathom water, from a weedy bottom, on the shores of Billiton, an island in the Java Sea, between Borneo and Sumatra.

The only notice in M. Rang's 'Manuel' is "Animal très imparfaitement connu." This species must vary in colour, as Quoy (Voy. Astrol.) states that the animal is "pale olive, darker spotted." Singularly enough, Quoy in his figure, as copied by Mrs. Gray ('Figures of Molluscous Animals,' t. 8. f. 8), has altogether omitted the operculum, which forms such a conspicuous appendage to the foot. It is a large, thick, dense, nearly opaque, claw-shaped operculum, composed of horny laminae, and is free at its posterior, curved, sharp-pointed extremity, like the operculum of *Fasciolaria Tarentina*, according to Della Chiave (Mrs. Gray's 'Figures of Molluscous Animals,' t. 8. f. 4). A. A.

## 29. CERITHIUM, *Bruguère*.

1. *CERITHIUM ARTICULATUM*. Pl. X. Fig. 14. Cer. testâ subulato-turritâ, solidâ, anfractibus planulatis, subobsoletè varicosis, transversim regulariter sulcatis, aperturâ parviusculâ; livido-albicante, varicibus subobscure albis, anfractuum margine superno rufo-fusco longitudinaliter lineato et maculato, anfractibus infrâ transversim articulatis.

HAB. Coast of Borneo, China Sea.

Each whorl has a narrow collar, as it were, round the upper part, in which the markings are longitudinal, while below they are transverse.

2. *CERITHIUM LONGICAUDATUM*. Pl. X. Fig. 15. Cer. testâ acuminato-turritâ, suturis concavo-impressis, anfractibus longitudinaliter nodoso-plicatis, transversim sulcatis, anfractu ultimo lativaricoso, canali retrorsum valdè producto, aperturâ parvâ; fuscescente-spadiceâ, anfractuum margine superno rufo maculato.

HAB. Korea.

Readily distinguished by the elongately produced structure of the canal.

3. *CERITHIUM OBTUSUM*. Pl. XIII. Fig. 3 *a, b*. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. ix. p. 294.

HAB. Borneo and Siugapore; at the mouths of rivers.

The animal of *Cerithium obtusum* has a broad, suborbicular, and expanded foot, and an elongated, subcylindrical, annulated trunk, of a light brown colour, with three rather broad, well-defined, opaque, yellow lines extending along its upper surface, the central one of which extends from the head to very near the extremity of the proboscis, where it is bifid, the two forks diverging; the two lateral lines are shorter, not bifid at their extremities, and reach forward on the head to within a little distance of the origin of the tentacles; the tentacles are very short, annulated, with the eyes (which are small, though with a distinct iris and pupil) situated at their tip, whereas they are mostly placed on tubercles situated on the outer side of the base of the tentacles, or on the tentacles themselves at a little distance from their origin. The foot is of a light pinky brown on its upper surface, mottled with a deep, rich brown, and on the under surface is lilac.

The *Cerithia obtusa* live in brackish water in mangrove-swamps and the mouths of rivers, in Singapore and Borneo. Sometimes they crawl on the stones and leaves in the neighbourhood, and are not unfrequently found suspended by glutinous threads to boughs and the roots of the mangroves, as represented in our plate. The operculum is round, horny, with a central nucleus and concentric elements; it is semitransparent, and borne upon the posterior part of the foot at its extreme end. When the animal hibernates, it retracts itself into the shell, and brings its operculum to fit closely into the aperture, after having previously affixed sixty or seventy glassy, transparent, glutinous threads to the place of attachment, when they occupy the outer or right lip and extend half-way round the operculum.

A species of *Cyclostoma* (*Megalomastoma suspensum*, Guilding) was found by the Rev. Lansdowne Guilding at the Island of St. Vincent, suspended in like manner from the trees; and *Rissoa parva* has been observed by Mr. Gray, upon our own shores (Pro. Zool. Soc. 1833, p. 116), to have the power of emitting a glutinous thread by which it attaches itself to floating sea-weeds.

There is a very handsome *Cerithium* closely allied to the foregoing, which I have frequently found crawling languidly on the leaves of the *Pontedera* and sedges in the fluviatile marshes on the banks of the rivers in many parts of Borneo, and many miles in the interior where the water is perfectly fresh, and which has the eyes likewise terminal and the proboscis marked with crimson and yellow; the foot is very dark brown, and has a vivid scarlet line extending round the lower margin. The position of the eye varies considerably in this group. In an amphibious Bornean species, allied to *C. decollatum*, they are terminal at the end of peduncles; in other words, the tentacles are connate with the eye-peduncles for the whole of their extent. In *C. microptera* the tentacles extend a third beyond the eye-peduncles; in *C. decollatum* the eye-peduncles are truncated, with the eyes at the end, while the tentacle extends beyond them in the form of a minute filament; all these species have circular multispiral opercula.

In another species, from the Island of Billiton, coral reef, two fathoms and a half, the animal is of a greenish brown, minutely punctulated with darker brown, and covered moreover with small, light red, round spots. The operculum is oval, horny, and semipellucid, the elements not concentric, curving from a nucleus at the anterior extremity towards the periphery. In this species the foot is moderately

broad, notched in front, rounded behind, and extended on either side towards the front part; there is a small, short siphon and a not very prominent muzzle; the tentacles are subulate, very thick at their base, and bearing the eyes on very distinct reflexions towards the tip on the outer surface. The eyes are furnished with a distinct pupil and iris. *A. A.*

### 30. TRIPHORIS, *Deshayes.*

1. TRIPHORIS SPECIOSUS. Pl. XI. Fig. 28 *a, b.* Triph. testâ acutè turritâ, medio subcylindraceâ, anfractibus octodecim ad viginti, biseriatis nodatis, nodorum serie superiore prominulâ, anfractu ultimo tubulato, valdè producto, canali etiam tubulato; albidâ, lineâ spirali aurantio-rufâ undique tinctâ.

HAB. China Sea.

The last whorl is curiously produced beyond the diameter of the shell in the form of a tube; and the canal is also tubular. The whorls are characterized by two rows of nodules, of which the upper is much the more prominent, and has a fine, spiral, orange-red line beneath it.

2. TRIPHORIS SUTURALIS. Pl. XI. Fig. 29 *a, b.* Triph. testâ turritâ, anfractibus duodecim ad tredecim, eximè triseriatim granuloso-carinulatis, suturis concavo-impressis, lævigatis; pellucido-albâ.

HAB. China Sea.

The aperture of this delicately grain-keeled species, which is characterized by its hollow sutures, is incomplete.

3. TRIPHORIS ALVEOLATUS. Pl. XI. Fig. 30 *a, b.* Triph. testâ elongato-pyramidali, anfractibus viginti ad quatuor et viginti, planulatis, spiraliter triseriatim hiratis, hiarum interstitiis clathratis; intus extusque fuscâ.

HAB. China Sea.

The whorls of this species are flattened and deeply latticed throughout. The aperture is incomplete.

4. TRIPHORIS DEXTROVERSUS. Pl. XI. Fig. 31 *a, b.* Triph. testâ elongato-pyramidali, gracili, anfractibus sedecim ad octodecim, medio concavis, spiraliter tricarinatis, carinâ medianâ multò minore, carinarum interstitiis sub lente minutè concentricè striatis, sordidè albâ.

HAB. China Sea.

This species differs from the rest of the *Triphorides* under consideration in being convoluted to the right. The surface of the whorls is concave, and keeled at the upper and lower margins. A fine keel intervenes in the centre, and the interstices are sculptured concentrically with very minute striæ.

5. TRIPHORIS VERRUCOSUS. Pl. XI. Fig. 32 *a, b.* Triph. testâ gracillimo-subulatâ, anfractibus octodecim ad viginti, granoso-clathratis, granis transversè oblongis; sordidè albâ.

HAB. China Sea.

A slender species, latticed throughout with transversely oblong granules.

6. *TRIPHORIS GRANULATUS*. Pl. XI. Fig. 33 *a, b*. Triph. testâ turritâ, medio subcylindraceâ, anfractibus duodecim ad quatuordecim, triseriatim granulatis, granulis regularibus confertis, anfractuum suturis subimpressis; sordidè albâ.

HAB. China Sea.

Distinguished by its short, cylindrical form, and by the precise arrangement of the granules with which it is sculptured.

7. *TRIPHORIS GEMMULATUS*. Pl. XI. Fig. 34 *a, b*. Triph. testâ pyramidali, basi concavo-planulatâ, anfractibus duodecim ad quindecim, planulatis, triseriatim granulatis, seriebus distantibus, medianâ ferè obsoletâ, inferiore prominulâ; pellucido-albâ.

HAB. China Sea.

A very distinct species, of true pyramidal form, encircled with three distant necklaces of granules, of which the middle is almost obsolete.

8. *TRIPHORIS PYRAMIDALIS*. Pl. XI. Fig. 36 *a, b*. Triph. testâ pyramidali, basi subplanatâ, anfractibus ad octodecim, supernè et infernè bicarinatis, carinis granulatis, inferiore minore; rufo-fuscescente.

HAB. China Sea.

Each whorl of this species is encircled with two granuled keels round the upper part and two round the lower part, and in each instance the lower keel is the smaller. The aperture, as in the preceding species, is incomplete.

9. *TRIPHORIS NODIFERUS*. Pl. XI. Fig. 37 *a, b*. Triph. testâ turritâ, anfractibus duodecim ad quatuordecim, medio subaugulatis, triseriatim nodosis, nodis transversim oblongis, ad angulum majoribus, aperturâ rotundâ, supernè sinuatâ, canali tubulato; albâ.

HAB. China Sea.

This, and the first here described, are the only species of which the specimens are complete at the aperture, and have the tubular canal which is characteristic of the genus.

## 6. PARASITICA.

### 31. *STYLIFER*, *Broderip*.

The accounts hitherto given of this parasitic mollusk, not being derived from living specimens, have not been satisfactory. Mr. Broderip described the mantle (Pro. Zool. Soc. 1832, p. 61) as thick, very large, and cup-shaped, enveloping the last whorl of the shell, whilst the animal presented only the rudiment of a foot. Mr. Gray observes (Zoology of

Beechey's Voyage, p. 138, sub nom. *Stylina*) that what has been considered the enlarged mantle is in reality the foot. The following observation is from the living animal.

The *Stylifer Astericola* (Pl. XVII. Fig. 5), found living in the body of a star-fish (*Asterias*), on the coast of Borneo, has two elongate, subulate tentacles, with the eyes sessile near the outer side of their base, and a small rounded head. The mantle is entirely enclosed and covered by the thin shell, and the foot is narrow, slender, very much produced beyond the head in front, and scarcely extended at all behind.

For the anatomy by Professor Owen, see Reeve's Conch. Systematica, vol. ii. p. 174.

## 7. TURBINACEA.

### 32. TURRITELLA, *Lamarck*.

The animal of *Turritella* is rather small for the size of the aperture of the shell; the head is small and oblong; the tentacles short and subulate, with the eyes on the middle of their outer side. The foot is moderate and slightly notched in front. Operculum orbicular, horny, many-whorled, with an epidermic fimbriated margin.

This mollusk is very shy and sensitive; retiring quickly within its shell on the slightest alarm. It is slow-moving and inactive. It seems to balance its unwieldy shell, though of comparatively light structure, with some degree of difficulty, and occasionally will remain fixed for hours in one spot. The fringed veil over the head is not usually visible, nor is the head of the animal often seen, so excessively timid is its disposition.

1. *TURRITELLA BICOLOR*. Pl. XII. Fig. 1. Turr. testâ acuminato-turritâ, anfractibus decem ad duodecim, convexis, subtilissimè quadriliratis et striatis, liris distantibus, obscurè granulatis; aureo-luteâ, suturis lirisque nigrescente-purpureis.

HAB. China Sea.

In addition to the above characters, there are a few puckered obliquely-wrinkled striae next the sutures.

2. *TURRITELLA CONGELATA*. Pl. XII. Fig. 2. Turr. testâ acutè subulatâ, basi angulatâ, anfractibus sedecim, convexo-planis, lævibus, obscurè triliratis, liris tenuibus, distantibus; pellucido-albâ.

HAB. China Sea.

Transparent at the base; towards the apex more opaque.

3. *TURRITELLA CONSPERSA*. Pl. XII. Fig. 3. Turr. testâ turritâ, anfractibus duodecim, supernè declivibus, deinde tumidis, et conspicuè bicarinatis et liratis; lutescente-albâ, fuscescente longitudinaliter undulatâ et punctatâ.

HAB. China Sea.

Delicately mottled throughout with irregular light-brown waved streaks, forming dots here and there next the sutures.

4. *TURRITELLA MULTILIRATA*. Pl. XII. Fig. 4. Turr. testâ acuminato-turritâ, anfractibus supernè contractis, infrâ leviter declivibus, internè canaliculatis, spiraliter multiliratis, liris subtilissimè granulatis; pellucido-albâ.

HAB. China Sea.

An extremely delicate transparent shell, encircled with numerous granulated ridges.

5. *TURRITELLA VITULATA*. Pl. XII. Fig. 5. Turr. testâ acuminato-turritâ, basi subconcovâ, anfractibus duodecim, ad suturas contractis, creberrimè spiraliter striatis, striis elevatis, subirregularibus, anfractibus perpaucis primis bicarinatis; fuscescente, striis interruptè castaneis.

HAB. China Sea.

The striæ of this species are not reticulated with chestnut, but merely coloured in an irregularly interrupted manner.

6. *TURRITELLA MONILIFERA*. Pl. XII. Fig. 6. Turr. testâ acuminato-pyramidali, basi depresso-concovâ, et acutè angulatâ, anfractibus quindecim, carinâ latiusculâ iufra suturas, medio convexis, deinde bi-liratis; rosaceo-albâ, carinâ punctis distantibus obliquis rufescente-fuscis ornatâ.

HAB. China Sea.

The only painting in this species, beyond its delicate pink hue, consists in the necklace-like row of red-brown dots upon the keel.

7. *TURRITELLA OPALINA*. Pl. XII. Fig. 7. Turr. testâ subventricosu-turritâ, tenuiculâ, anfractibus duodecim, rotundatis, supernè depresso-caniculatis, sub lente minutissimè creberrimè inciso-striatis; pellucido-albâ, fuscescente pallidè concentricè flammâtâ.

HAB. China Sea.

Distinguished by its rounded whorls and opal-white substance.

8. *TURRITELLA FASTIGIATA*. Pl. XII. Fig. 9. Turr. testâ gracillimo-subulatâ, tenuiculâ, anfractibus octodecim ad viginti, supernè contractis, declivibus, deinde rotundatis, undique subtilissimè liratis et striatis, apicem versus bicarinatis; violaceo alboque pallidè variegatâ, strigis fusciscentibus obliquis, liris obscurè fusco punctatis vel articulatis.

HAB. China Sea.

The oblique clouded streaks of painting are very characteristic in this species.

9. *TURRITELLA DECLIVIS*. Pl. XII. Fig. 10. Turr. testâ pyramidali-turritâ, basi plano-angulatâ, anfractibus octodecim, plano-declivibus, basin versus gradatim latioribus, undique creberrimè subtilissimè undulato-striatis, prope apicem medio plicatis; lutescente-albâ, livido-fusco tinctâ et apicem versus peculiariter maculatâ.

HAB. China Sea.

In this very interesting species the livid brown appears in the first few whorls in a necklace of spots beneath the sutures.



10. *TURRITELLA CANALICULATA*. Pl. XII. Fig. 11. Turr. testâ acuminato-turritâ, anfractibus duodecim, spiraliter acutè sex-liratis et striatis, interstitiis striis obliquis cancellatis, liris tenuibus duabus inferioribus prominulis; sordidè albâ.

HAB. China Sea.

The two lower ridges, more prominent than the rest, form a spiral channel immediately above the suture.

### 33. *EGLISIA*, *Gray*.

1. *EGLISIA TRICARINATA*. Pl. XII. Fig. 8. Egl. testâ acutè turritâ, anfractibus ad octodecim, supernè contractis et declivibus, deinde tricarinatis, sub lente longitudinaliter creberrimè et tenuissimè cancellato-striatis, aperturâ parvâ, rotundâ; sordidè cinereo-fuscâ.

HAB. China Sea.

The cancellated structure of this species very much resembles that of *Eglisia lanceolata*.

### 34. *LITTORINA*, *Férussac*.

1. *LITTORINA CASTANEA*. Pl. XI. Fig. 8. Litt. testâ ovato-conicâ, spirâ breviusculâ, apice acutâ, anfractibus supernè depressis, rotundatis, spiraliter carinatis, columellâ arcuatâ, callosâ, aperturâ suborbiculari; intensè castaneâ.

HAB. Eastern Seas.

Very near the typical form of the genus, strongly spirally keeled throughout.

### 35. *MARGARITA*, *Leach*.

1. *MARGARITA BICARINATA*. Pl. XI. Fig. 11 *a, b*. Marg. testâ depresso-orbiculari, perampliter umbilicatâ, apice acutâ, anfractibus spiraliter bicarinatis, carinis distantibus, interstitiis concavis, spiraliter creberrimè lineatis, concentricè striatis; fuscescente aut flavicante, flammulis rubidis variè pictâ, carinis rubido obliquè articulatis, aperturæ fauce iridescente.

HAB. Eastern Seas.

This very interesting species of *Margarita* is characterized externally by a certain metallic hue, whilst it is particularly iridescent in the interior.

### 36. *ROTELLA*, *Lamarck*.

1. *ROTELLA CONICA*. Pl. XI. Fig. 22 *a, b*. Rot. testâ conoideâ, lævigatâ, obsoletè concentricè striatâ; cupreo-castaneâ, apicem versus rubescente-purpureâ, lineis fuscis concentricis undulatis obscure notatâ.

HAB. Mouth of the Lundu river, coast of Borneo.

Notwithstanding that the painting of the *Rotella* is extremely variable, all that were collected of this species are characterized by the same dark purple-red chestnut.

37. PHORUS, *De Montfort.*

The propriety of distinguishing the 'Carrier *Trochi*' as a separate genus, is fully confirmed by the present discovery of two living species, in both of which the soft parts are distinct from those of *Trochus* proper. Except in that the eyes are not raised on pedicles, the outward form of the animal is similar to that of *Strombus*, which *Phorus* resembles also in its mode of progression. The shell produced by these genera is, however, so materially different in its formation, there can be but little zoological affinity between them.

The animal of *Phorus* is very slender in proportion to the size of the aperture of the shell. The foot is small, produced, as it were, into two parts, of which the front is rather expanded and more subservient to the purposes of locomotion, and the hinder tapering, supporting a large horny operculum, which is partially free, as in *Solarium*. The proboscis is very prominently developed and annulate; and the tentacles are long and tapering, with the eyes completely sessile on the outside of their base. The portion of the mantle lining the aperture of the shell is vascular, thin, and delicate, extending over the front and outer lip, which is often much produced and uneven in outline, especially in *P. Indicus* and *exutus*.

The *Phori* are arranged by Mr. Gray next in order to the *Calypttræ*, but it is obvious that the genera, as already anticipated in the 'Conchologia Iconica,' are very remote from each other; the former have a divided *Stromb*-like operculated foot, are of active habits, and produce a regular convoluted shell, whilst the latter have a simple foot, live attached to foreign bodies, are incapable of progression, have no operculum, unless the rare secretion of a calcareous plate to the place of attachment can be regarded as the analogue of one, and the shell is not formed on the spiral type; all which external differences concur to show that the *Phori* and *Calypttræ*, whether regarded as genera or families, have little or no affinity with each other.

The *Phori* invariably inhabit rough places incapable of accommodating a gliding motion, and their mode of progression, like that of the *Strombi*, is by little jumps. Each species has its own peculiar manner of collecting the debris of shells or pebbles which cover the ground it inhabits, and each has, to a certain extent, its peculiar kind of debris; their conchological peculiarities have, however, been already described in detail in the 'Conchologia Iconica.'

1. PHORUS SOLARIOIDES. Pl. XVII. Fig. 6. Reeve, Conch. Icon. *Phorus*, pl. 3. f. 8. The animal of this species is characterized throughout by numerous circular striae, the tentacles are laterally compressed and rather prismatic, the proboscis is long and transversely wrinkled, yellow at the tip and on the under surface, but pink between the tentacles, which are straight, rigid, and opaque dead-white; the eyes are black and conspicuous.

HAB. China Sea.

2. PHORUS EXUTUS. Pl. XVII. Fig. 7. Reeve, Conch. Icon. *Phorus*, pl. 2. f. 7 a, b. The animal

of this species is smoother than that of the preceding, the tentacles being longer and the eyes smaller, placed on slight swellings, not, however, resembling even the rudiments of peduncles.

HAB. Eastern Seas.

The *operculum* of *Phorus* is horny, soft, and flexible, formed of concentric and radiating fibres. On the under surface it is smooth and attached to the foot by the central part, and free around the circumference and posterior portion. On the upper surface it is covered with radiating ridges, or salient processes formed by the constituent fibres being elevated in succession one above another.

### 38. DELPHINULA, *Lamarck*.

1. DELPHINULA STELLARIS. Pl. XI. Fig. 7. Delph. testâ orbiculari-discoideâ, spirâ depresso-planâ, subampliter umbilicatâ, anfractibus supernè concavo-angulatis, ad angulum squamato-carinatis, squamis compressis, erectis, infrâ regulariter squamato-spinosis; albâ, purpurascente sparsim tinctâ.

HAB. Eastern Seas, near Basilan.

This has very much the appearance of an immature shell, although it differs from the young of any of the larger described species.

### 39. SCALARIA, *Lamarck*.

1. SCALARIA MACULOSA. Pl. XI. Fig. 14. Scal. testâ elongato-turritâ, vix umbilicatâ, anfractibus decem, rotundatis, lævibus, politis, costis annularibus subdistantibus, tenuibus, prope suturas latioribus et flexuosis; cærulescente-albâ, fusco promiscuè maculatâ.

HAB. China Sea.

The brown spots which characterize this species have a promiscuous blotchy appearance, about two between each annular rib.

2. SCALARIA NEGLECTA. Pl. XI. Fig. 15. Scal. testâ conico-turritâ, profundè umbilicatâ, anfractibus septem ad octo, rotundatis, lævibus, aut, sub lente, minutè spiraliter impresso-striatis, costis annularibus subdistantibus, angustis, elevatis, prope suturas spiuoso-uncinatis, aperturâ rotuudatâ, labro dilatato; carneo-fuscescente, costis albis.

HAB. China Sea.

The hook-like spine upon the upper part of the ribs is laterally very compressed and bent slightly backwards.

3. SCALARIA EXIMIA. Pl. XI. Fig. 16. Scal. testâ pyramidali-turritâ, acutè acuminatâ, haud umbilicatâ, anfractibus novem, costis annularibus numerosis, angustis, lamellatis, prope suturas conspicuè spinoso-uncinatis, costarum interstitiis eximiè spiraliter liratis; cærulescente-albâ.

HAB. China Sea.

The prominent uncinat spine upon each rib gives a beautiful pyramid-like form to

the shell, which is further characterized by having the interstices of the ribs sculptured with spiral equidistant ridges.

#### 40. CHEMNITZIA, *D'Orbigny*.

1. CHEMNITZIA GRANDIS. Pl. XI. Fig. 17. Chemn. testâ elongato-turritâ, anfractibus compluribus, plano-convexis, suturis tamen distinctis, longitudinaliter creberrimè costatis, costis subprominentibus, flexuosis, anfractu ultimo infrâ lævigato; albâ.

HAB. Eastern Seas.

The ribbed sculpture of the whorls ceases at the sutures; below that point the whorls are smooth, as shown in the last whorl.

#### 41. EULIMA, *Risso*.

The head of *Eulima* is small, with the tentacles subulate, and close together at the base, where they are rather swollen. The eyes are situated at the back of the head, behind the tentacles. The foot is rather expanded, especially at the sides, and is furnished with an ovate sub-spiral operculum. The polish of the shell is occasioned by the front edge of the mantle being extended over it; the lobes are, however, difficult to observe, in consequence of the extreme timidity of the animal in speedily retracting them, when disturbed.

The soft parts of *Eulima major* are, like the shell, of which several fine specimens were collected, of an opaque pearly white, except that the tentacles are delicately tinged with orange in the middle and with yellow at the tip. The eyes, which are black, are usually concealed beneath the front of the shell.

1. EULIMA UNILINEATA. Pl. XI. Fig. 23. Eul. testâ aciculatâ, anfractibus octo, plano-contiguïs, aperturâ suboblongâ; rufo-brunneâ, lineâ unicâ nigricante cingulatâ.

HAB. Sooloo Sea.

A rich red-brown sharply aciculated shell, with the sutures almost obsolete, encircled throughout with a faint blackish line.

2. EULIMA BILINEATA. Pl. XI. Fig. 24. Eul. testâ aciculatâ, anfractibus novem ad decem, plano-convexis, aperturâ oblongâ, labro supernè inflexo; pellucido-albâ, vitreâ, lineis tenuibus duabus castaneis cingulatâ.

HAB. Sooloo Sea (from the stomach of an *Echinus*).

A light transparent glassy shell, encircled with two delicate brown lines, of which the lower falls exactly in the place of the sutures.

3. EULIMA MINDOROENSIS. Pl. XI. Fig. 25. Eul. testâ elongato-turritâ, basi subobesâ, suturis impressis, anfractibus decem, convexis, aperturâ ovatâ; pellucido-albâ, opaco-albo maculatâ et lineatâ.

HAB. Mindoro Sea, Philippines.

Unlike the preceding species, the sutures of this are rather strongly impressed.

4. *EULIMA TORTUOSA*. Pl. XI. Fig. 26. Eul. tortuoso-acuminatâ, anfractibus duodecim ad quatuordecim, plano-contiguâ, obliquè varicosis, aperturâ parviusculâ; eburneâ, infra suturas obscure lineatâ.

HAB. China Sea.

Only the tortuous species of *Eulima* are varicose, depending doubtless on some concomitant peculiarity of the animal.

5. *EULIMA SOLIDULA*. Pl. XI. Fig. 27. Eul. testâ abbreviato-turritâ, solidulâ, tortuosâ, varicosâ, anfractibus novem ad decem, convexis, aperturâ parvâ; eburneâ.

HAB. China Sea.

A solid contracted shell, with the whorls more convex than in the preceding species.

#### 42. *RISSOA, Fréminville.*

1. *RISSOA INSIGNIS*. Pl. XI. Fig. 20. Riss. testâ abbreviato-turritâ, basin versus obesâ, anfractibus supernè plano-angulatis, ad angulum acutis, spiraliter striatis, anfractibus primis valdè contractis et longitudinaliter peculiariter foveolatis, aperturâ subamplâ, dilatatâ; albidâ.

HAB. China Sea.

This is truly a remarkable shell: the upper part of the first few whorls is peculiarly flatly angled and deeply pitted longitudinally; at the last whorl but one the angle and the pits suddenly cease.

### S. PLICACEA.

#### 43. *PYRAMIDELLA, Lamarck.*

1. *PYRAMIDELLA MAGNIFICA*. Pl. X. Fig. 1. Pyram. testâ pyramidali-conicâ, subcylindraceâ, spiræ suturis impressis, anfractibus quatuordecim, plano-convexis, supernè canaliculatis, longitudinaliter crebriliratis, interstitiis foveolatis, anfractu ultimo ecostato, promiscuè foveolato, columellâ fortiter triplicatâ, aperturâ anticè submarginatâ; albidâ, ferrugineo-fusco tinctâ et maculatâ.

HAB. Shores of Borneo, China Sea.

This fine species of *Pyramidella*, of which only a single specimen was collected, forms an interesting addition to this very limited genus.

## 9. IANTHINEA.

44. IANTHINA, *Lamarck*.

1. IANTHINA STRIOLATA. Pl. XI. Fig. 9. Ianth. testâ subgloboso-ovatâ, spirâ brevi, suturis parum impressis, anfractibus rotundatis, spiraliter impresso-striatis, striis tenuibus, flexuosis, aperturâ orbiculari-ovatâ; pallidè violaceâ.

HAB. Pacific Ocean.

Several examples were collected of this species, as well as of *I. globosa*, to which it is so closely allied. It differs in having the spire less depressed and the aperture less dilated in front, whilst the spiral striæ are peculiar and the shell is uniformly of smaller size.

2. IANTHINA PLANISPIRATA. Pl. XI. Fig. 10. Ianth. testâ discoideâ, spirâ depressâ, plano-convexâ, anfractibus ad peripheriam subacutè rotundatâ, aperturâ latiusculâ, anticè leviter sinuatâ; intensè violaceâ, apicem versus pallidiore.

HAB. Atlantic Ocean.

Chiefly distinguished by its narrow compressed mode of convolution, by which the spire is unusually depressed.

## 10. NERITACEA.

45. NATICA, *Lamarck*.

1. NATICA MACROTREMIS. Pl. XIII. Fig. 9. Nat. testâ subglobosâ, spirâ depressâ, perampliter umbilicatâ, umbilico patente, profundissimo, infundibuliformi, anfractibus convexis, lævibus, politis, aperturâ semiorbiculari; virescente-albâ.

HAB. Coast of Borneo.

The *Natica melanostoma* (Pl. XIX. Fig. 7) is furnished with a strong coriaceous foot, well developed in front, by means of which it perforates the sand, while its tentacles are protected; but when the tide rises and covers the sands, the large side lobes and dilated hind part of the foot are expanded, and the *Natica* flaps along above the sand. A great peculiarity in the animal of this family is the existence of an operculigerous lobe, which in the polished species nearly covers the shell, and is seen in our figure mounting up behind and partly covering the sides. In *Sigaretus* this lobe is extended entirely across, and covers the shell, while the operculum is rudimentary; in *Coriocella* it not only encloses the shell, but extends beyond it in front, and has been erroneously termed the mantle.

46. SIGARETUS, *Lamarck*.

1. SIGARETUS ACUMINATUS. Pl. XIII. Fig. 8. Sig. testâ oblongo-ovatâ, ventricosâ, subumbilicatâ,

spirâ acuminatâ, suturis impressis, anfractibus convexis, spiraliter latistriatis, striis planatis, undulatis, interstitiis plano-excavatis; intus extusque albâ.

HAB. Coast of Borneo.

Chiefly distinguished by its acuminate inflated form.

2. SIGARETUS INSCULPTUS. Pl. XIII. Fig. 10. Sig. testâ depresso-orbiculari, auriformi, spirâ ferè occultâ, spiraliter latistriatâ, striis planatis, leviter undulatis, interstitiis plano-excavatis; albâ, ferrugineo-luteo pallidissimè tinctâ, apice purpurascence-cinereâ.

HAB. Eastern Seas.

The sculpture of this species is similar to that of the preceding, although the shell differs so materially in form.

3. SIGARETUS LATIFASCIATUS. Pl. XIII. Fig. 11. Sig. testâ depresso-orbiculari, auriformi, spirâ brevissimâ, spiraliter tenuistriatâ, striis vix undulatis, subtus concavâ; albidâ, fasciâ latissimâ cinerascence, apice purpureo-cinereâ, aperturae fauce sub fasciâ castaneo-brunneâ.

HAB. Eastern Seas.

## 11. AURICULACEA.

The habits of this family are somewhat variable. *Marinula* affects salt-water only, and *Pedipes* lurks in the cavities of rocks and under stones exposed to the sea. *Cassidula* is amphibious, having been observed crawling on a sandy bottom in clear water at a depth of nearly two fathoms, as well as in mangrove-swamps and on the sea-beach. *Auricula* and *Melampus* live in damp situations near the sea, and on the muddy banks of rivers. *Scarabus* inhabits moist situations in woods near the sea, but is wholly of terrestrial habits, living on decayed vegetable matter, and crawling about actively after showers of rain. *Alexia* and *Carychium* abound in salt-water marshes.

### 47. AURICULA, *Lamarck*.

1. AURICULA SUBULA. Pl. XIV. Fig. 15. Quoy and Gaimard, Voy. de l'Astrol. pl. 13. f. 39, 40. The head of this species is broad, the muzzle produced and bilobed, the tentacles rather flattened and tapering, and the eyes sessile on their inner bases. Colour of a uniform light grey-brown.

HAB. Celebes, on the muddy banks of rivers out of the reach of the water.

The *A. subula* crawls but slowly. In young individuals the columella is truncate and the outer lip thin.

2. MELAMPUS LEUCODON. Pl. XIV. Fig. 17. Beck? In this species, which is of a uniform dull pale black, the eyes are small and placed at the inner base of the tentacles, which are flattened, the muzzle is slightly produced and longitudinally cleft, and the end of the foot is slightly bifid.

HAB. Island of Mayo, from the damp margins of a water-course, crawling over the moist rocks.

48. SCARABUS, *De Montford*.

1. SCARABUS TRIGONUS. Pl. XIV. Fig. 12. Troschel, Reeve Conch. Syst. vol. ii. pl. 183. f. 2. Head and lower part of the tentacles blackish-brown, rest of the animal pale brown, whitish towards the end of the foot. The tentacles are annulated, with a swelling at the base, on the inner side of which are the sessile black eyes surrounded by a light areola; the tentacles are comparatively long and cylindrical in this species.

HAB. Borneo, under dead leaves.

2. SCARABUS IMBRIUM. Pl. XIV. Fig. 13. De Montford, Conch. Syst. The animal of this species varies in colour according to the shell: when the latter is dark, the animal has a blackish head and neck, growing gradually paler towards the hind part of the foot; the animals of the light-coloured shells are of a uniform pale brown.

HAB. Celebes and Borneo, under dead leaves and decayed vegetable matter in the forests near the sea-coast.

3. SCARABUS CUMINGIANUS. Pl. XIV. Fig. 16. Petit, Pro. Zool. Soc. 1843, p. 3. Animal of a light chestnut-brown, the muzzle rather produced, the tentacles subulate and annulated, with the eyes sessile at their inner bases, surrounded by a light-coloured areola.

HAB. Koo-Kien-San, one of the Meiacoshima group of islands, near Formosa, in the Blue Sea.

## 12. CYCLOSTOMACEA.

The subgeneric types of this extensive and interesting group vary also in their habits, for while *Leptopoma* invariably lives among the foliage of the trees, *Cyclophorus* inhabits the decayed vegetable matter at their roots. *Pterocyclos* is found in moss among loose stones. *Nematura* and many of the *Cyclostoma* proper are semi-aquatic; the former inhabiting ponds, attached to the under surface of floating leaves, and the latter being found among loose stones near the sea-shore.

49. CYCLOSTOMA, *Lamarck*.

1. CYCLOSTOMA SPIRACELLUM. Pl. XIV. Fig. 1. Cyclost. testâ suborbiculari, planorbulâ, spirâ depressâ, pallidâ, anfractibus quatuor, rotundatis, transversim striatis, suturâ distinctâ, ultimo dorso inflato, demum coarctato et quasi strangulato, varice fornicato prope aperturam, aperturâ circulari, peritremate duplici, internè posticè emarginato, externè reflexo, posticè in canalem desinente, anfractu ultimo spiraculum tubulosum prope aperturam gerente, umbilico patulo, anfractibus intus conspicuis. Operculo circulari, spirali, intus corneo, concavo, extus testaceo, margine sulcato.

HAB. Borneo, under decayed vegetable matter in the forests.

A small species, largely umbilicated, belonging to the division *Pterocyclos*.



2. *CYCLOSTOMA LÆVE*. Pl. XIV. Fig. 3. Gray, Wood Ind. Test. Supp. pl. 6. f. 5. In this species, which is a good typical example of *Leptopoma* of Troschel, the eyes are on short peduncles at the outer base of the tentacles, which are long and setaceous, the muzzle is produced and bilobed, and the foot is elongated and tapering beyond the large, circular, subtransparent, multispiral, horny operculum. Pale straw-colour.

HAB. Manado, Island of Celebes, upon the leaves of the Screw-pine (*Pandanus*).

All of this group of *Cyclostomata* have light ventricose shells, and live upon the foliage of the trees, among which they move actively in the rainy season, and hibernate during the dry months by adhering to the under surface of the leaves.

3. *CYCLOSTOMA TENEBRICOSUM*. Pl. XIV. Fig. 6 *a, b*. Cyclost. testâ globoso-conicâ, subpellucidâ, fuscâ, intensè fusco variegatâ, fasciâ pallidâ circumcinctâ, spirâ acuminatâ, apice obtusâ, anfractibus quatuor, rotundatis, ultimo subventricosos, aperturâ subcirculari, peritremate prope ultimum anfractum interrupto, umbilico parvo. Operculum?

HAB. Balambangan, Borneo, on the leaves of the *Pandanus*.

The pale central band coming in the place of the sutures is seen only on the last whorl.

4. *CYCLOSTOMA RETICULATUM*. Pl. XIV. Fig. 8 *a, b*. Cyclost. testâ globoso-conicâ, subpellucidâ, spirâ subconoidali, apice obtuso, anfractibus quinque, ventricosis, brunneis, albo conspicuè reticulatis, spiraliter carinatis, carinis ferè obsoletis, multis, confertiusculis, aperturâ ferè circulari, peritremate reflexo, supernè acuminato, ad ultimum anfractum subinterrupto, umbilico magno, spiraliter sulcato. Operculo testaceo, spirali, extus in medio concavo, anfractibus 4-5, margine sulcato.

HAB. Island of Madagascar.

Remarkably characterized by its striking white reticulated marbling.

## 50. PUPINA, *Vignard*.

1. *PUPINA MINDORENSIS*. Pl. XIV. Fig. 2. Pup. testâ subcylindræo-turritâ, crassiusculâ, fuscâ, tenuissimè striatâ, anfractibus sex, subrotundatis, aperturâ circulari, peritremate discontinuo, labio externo reflexo, incrassato, pallido, ad basin columellarem canali angusto, et posticè in canalem spiralem desinente.

HAB. Island of Mindoro, Philippines.

This species has not the polished surface of the *P. Nunczii* and others; it is of a dull rust-brown, with the lip very much thickened.

## 13. COLIMACEA.

The *Arions* and *Limaces* of temperate climates are represented in the East by the *Onchidium*, *Veronicella*, and *Peronia*, as they are in the western hemisphere by the *Vaginula*. The *Veronicella* lives upon the trees in the forests, and is active after showers; the *Onchidia* live

on aquatic plants in ditches ; while *Peronia*, like *Onchidoris*, lives among the stones on beaches, but, unlike the latter genus, above high-water mark, a little beyond the influence of the tide.

### 51. BULIMUS, *Lamarck*.

1. BULIMUS GREGARIUS. Pl. XIV. Fig. 4. Bul. testâ cylindræo-turritâ, compressè umbilicatâ, anfractibus octo, obliquè impresso-striatis, suturis impressis, columellâ verticaliter dilatâtâ, aperturâ parvâ, subquadrato-ovatâ, labro subreflexo ; pellucido-cornèâ.

HAB. Sarawak, Borneo.

The oblique striæ arc extremely superficial, and the shell is of a thin horny substance.

2. BULIMUS MEIACOSHIMENSIS. Pl. XIV. Fig. 5. Bul. testâ subpyramidali-oblongâ, vix umbilicatâ, anfractibus decem, subangustis, columellâ verticaliter reflexâ, aperturâ rotundâ ; pellucido-cornèâ.

HAB. Islands Ty-pin-san and Koo-Kien-san, Meiacoshima group, Yellow Sea.

A small thin horny species, collected among the loose stones and leaves about the tombs.

3. BULIMUS CHLORIS. Pl. XIV. Fig. 10. Reeve, Conch. Icon. *Bul.* pl. 37. f. 223.

The animal of *B. chloris* is of a pale brown colour, always differing in this respect from that of *B. citrinus*, and of extremely vivacious habits. A bushel of them, collected on the mountains of Mindanao, soon dispersed themselves all over the cabin in which the basket was deposited. The shell was of the same elongated form and deep yellow colour throughout, with no indication of bands or marking.

4. BULIMUS CITRINUS. Pl. XIV. Fig. 11. Bruguière, Reeve Conch. Icon. *Bul.* pl. 31: f. 187 *a*.

The animal of this variety of *B. citrinus* is marked with dark colour, especially about the head and neck, corresponding in a manner to the pattern of the shell. It inhabits in comparative plenty the low trees and bushes of Rhio and other small islands in the vicinity of Singapore ; the specimen figured is from a little islet off Biliton.

5. BULIMUS ADAMSII. Pl. XV. Fig. 1 *a, b*. Reeve, Conch. Icon. *Bul.* pl. 13. f. 73 *a, b, c, d*.

HAB. Eastern coast of Borneo, on a tall tree in an islet between Banguay and Balambangan.

Two varieties of this beautiful species were described in the 'Conchologia Iconica,' on the return of the Samarang, about two years since. A tree which was being cut down in the above-mentioned islet, fell upon one of the carpenters, depriving him for a time of sensation. What proved a misfortune to the man was a gain to science, for a number of this delicately-painted *Bulimus* were found adhering to the tree.

Dr. Gould, of Boston, United States, communicated to us his opinion that it might be

his *B. monilifer* from Tavoy, in Siam; he has, however, very kindly forwarded specimens of that species, which proves to be clearly distinct, and will be figured in a supplementary plate to the monograph of the genus in Conch. Icon.

## 52. HELIX, *Linnaeus*.

1. HELIX CALLIOSTOMA. Pl. XIV. Fig. 7 *a, b*. H. testâ obconicâ, obtectè perforatâ, valdè carinatâ, albâ, supernè planiusculâ, transversim obliquè striatâ, striis interruptis, longitudinaliter lineis impressis obsitâ, cingulis angustis et maculis rufo-violascentibus circumdatâ, anfractibus quatuor ad quinque, planiusculis, basi convexâ, infra carinam concavâ, reticulato-striatâ, fasciis rufescentibus multis circumdatâ, aperturâ angulatâ, depressâ, intus purpurco-violascente, peristomate intus incrassato, rubicundo.

HAB. — — ?

A solid depressed sharply-angled species, encircled throughout with irregular brown and purple-brown linear bands, whilst the aperture is deeply stained with violet-red.

2. HELIX CURVILABRUM. Pl. XIV. Fig. 9 *a, b*. H. testâ conicâ, perforatâ, basi acutè carinatâ, lævi, flavicante, prope suturam cingulâ latâ rufo-castaneâ, basi planiusculâ, omninè castaneâ, aperturâ subangulatâ, depressâ, obliquâ, margine superiore dilatato, inflexo, peristomate incrassato.

HAB. Philippine Islands.

A flattened conical shell, conspicuously umbilicated, with the lip peculiarly curved at the edge. The base is of a dark reddish chestnut, the spire yellowish, spirally banded with the chestnut colouring against the sutures.

3. HELIX TROPIDOPHORA. Pl. XIV. Fig. 14. H. testâ subdiscoideâ, imperforatâ, valdè carinatâ, carinâ acutâ, prominulâ, brunneâ, striis minutis confertis reticulatâ, anfractibus quinque, convexiusculis, aperturâ lunato-transversâ, angulatâ, peristomate simplici, acuto.

HAB. Borneo.

A comparatively thin shell, with simple lip, very sharply keeled, of which the base has a shining horny aspect.

4. HELIX OBSCURATA. Pl. XIV. Fig. 18. H. testâ discoideâ, latè et profundè umbilicatâ, olivaceâ, obliquè striatâ, striis transversis distinctis decussatis, spirâ depressâ, anfractibus ad quinque, rotundatis, aperturâ lunato-rotundatâ, labio simplici, acuto.

HAB. Borneo, under decayed leaves in the forests.

A small rounded species, composed of rounded whorls, broadly umbilicated, after the manner of the large *H. Banksii*.

5. HELIX TAYLORIANA. Pl. XV. Fig. 2 *a, b*. H. testâ conicâ, trochiformi, lævi, imperforatâ, subpellucidâ, basi acutè carinatâ, fulvâ, ad apicem carneolâ et reticulatâ, maculis sparsis perlucidis fuscis obsitâ, obliquè striatâ et transversim subtilissimè rugulosâ, spirâ acutâ, basi convexiusculâ, fulvâ, circa

regionem umbilicalem carneolâ, aperturâ triangulari, anticè valdè productâ et coarctatâ, peristomate atro-purpureo, incrassato, reflexo.

HAB. — ?

An extremely delicate and characteristic species, remarkable for the spouted angular construction of the lip.

6. *HELIX TYPINSANA*. Pl. XV. Fig. 3 *a, b*. H. testâ discoideâ, depressiusculâ, subcarinatâ, latè et profundè umbilicatâ, striis obliquis, confertis, corrugatis, olivaceo-fuscâ, fasciâ pallidâ cingulatâ, spirâ obtusâ, anfractibus septem ad octo, rotundatis, aperturâ rotundâ, peristomate intus carneolo, margine acuto, reflexo.

HAB. Island of Ty-pin-san, Meiacoshima; found under decayed leaves in the pine-woods.

The whorls of this species are coiled round a broad axis, forming a large and deep umbilicus, as in *H. polygyrata*; they are, however, less in number and not so depressed.

7. *HELIX BROOKEL*. Pl. XV. Fig. 4 *a, b*. H. testâ magnâ, sinistrorsâ, subdiscoideâ, obesâ, imperforatâ, obtusâ, carinatâ, obliquè strigillatâ, corneo-fuscâ, epidermide crassâ indutâ, castaneâ, carinâ purpurascente, suprâ pallidulâ, basi convexâ, radiatim striatâ, anfractibus quatuor ad quinque, aperturâ obliquâ, peristomate incrassato, intus cærulescente-albâ.

HAB. Mountains of Borneo.

This fine species, which has very much the appearance of a sinistral *H. Otaheitana*, was brought by the Borneo Dyaks to his Excellency, the Rajah Sir James Brooke, to whom we have the pleasure of dedicating it.

8. *HELIX BATANICA*. Pl. XV. Fig. 5 *a, b*. H. testâ depresso-globosâ, sinistrorsâ, angustè perforatâ, albidâ, fasciis fusco-rubris circumdatâ, epidermide olivaceo-luteâ indutâ, anfractibus quinque, convexusculis, transversim obliquè striatis, ultimo rotundato, aperturâ transversò-lunatâ, peristomate incrassato, subreflexo.

HAB. Island of Batan (Bashee group), under weeds and low plants on the ground.

A small globular reversed species, reminding one somewhat of the British *H. nemoralis*, though of more solid structure.

9. *HELIX MACKENSII*. Pl. XV. Fig. 6 *a, b*. Valenciennes, Voy. de la Bonite, pl. 25. f. 14.

HAB. Island of Ty-pin-san, Meiacoshimas.

Several examples of this interesting species were collected at the above-named island. The hairs which grow from the epidermis at the periphery of the whorls, are most conspicuous in young specimens.

10. *HELIX VITATA*. Pl. XV. Fig. 7 *a, b, c*. H. testâ subdiscoideâ, sinistrorsâ, umbilicatâ, pellucidâ, acutè carinatâ, supernè depressâ, suturâ indistinctâ, carneolâ, fasciis quatuor ad quinque fulvicantibus

cingulatâ, striis undulatis granulosis obliquis et lineis concentricis decussatâ, anfractibus sex, planiusculis, ultimo basi convexo, fasciis duabus fulvicantibus circumdato, carinâ et regione umbilicali opaco-albis, aperturâ depressâ, angulatâ, obliquâ, peristomate simplici, acuto.

Animal of a delicate subtransparent pinkish colour, the free lobes of the mantle movable, and often extended from the fore part of the shell; eye-peduncles long, the truncatures for the eyes very broad, tentacles rather long and clavate; foot compressed, finely crossed with oblique lines, and margined inferiorly, the end with a large hollow muciparous follicle, ending below in a sharp, moveable, rather recurved process.

HAB. Balambangan, Borneo.

This beautiful and singular species lives among the foliage of the low trees, about which it crawls with surprising rapidity, reminding one of the movements of the *Vitrinæ* more than those of the *Helicidæ*.

11. *HELIX ANTIQUA*. Pl. XVI. Fig. 1. H. testâ globoso-acuminatâ, solidâ, obtectè perforatâ, albâ, obliquè striatâ, anfractibus quatuor ad quinque, subrotundatis, ultimo inflato, aperturâ obliquè orbiculari, labro latè effuso-reflexo, umbilicam ferè tegente.

HAB. Borneo.

A shell of antique elegance of form, found in a dead state among loose stones in the province of Unsang, Borneo.

12. *HELIX COREANICA*. Pl. XVI. Fig. 2. H. testâ depresso-globosâ, perforatâ, rufo-spadiceâ, rugulosâ, obliquè striatâ, fasciâ pallidâ cingulatâ, apicem versus albicante, aperturâ lunato-ovali, peristomate simplici, acuto.

HAB. Corean Archipelago.

This is the common snail of the islands of the Corean Archipelago, where it is used as an article of food.

13. *HELIX LEUCOSTOMA*. Pl. XVI. Fig. 3. H. testâ orbiculari-conoideâ, umbilicatâ, glabrâ, obliquè striatâ, apud suturam opaco-albâ, anfractibus quinque, convexis, flavescens, fasciis rufo-spadiceis circumdatis, aperturâ lunato-transversâ, intus albâ, nitidâ, peristomate albo, valdè reflexo, margine inferiore calloso.

HAB. Philippine Islands.

Very like *H. sepulchralis*, but differing slightly in form, and distinguished by a marked peculiarity of colouring.

14. *HELIX ORIENTALIS*. Pl. XVI. Fig. 4. H. testâ depresso-globosâ, profundè umbilicatâ, fusco-aurantiâ, obliquè striatâ, lineis numerosis elevatis minutis concentricis decussatâ, anfractibus quinque, subrotundatis, fasciis duabus castaneis cingulatis, aperturâ lunato-ellipticâ, peristomate reflexo, intus violaceo-corneo.

HAB. Borneo.

The lip of this species is reflected with a characteristic violet-flesh tinge.

15. *HELIX IMMACULATA*. Pl. XVI. Fig. 5. H. testâ pyramidali-globosâ, vix umbilicatâ, albâ, semi-pellucidâ, nitidulâ, striis incrementi distinctis, anfractibus quinque, convexiusculis, ultimo subcarinato, aperturâ lunato-orbiculari, peristomate parum reflexo.

HAB. Philippine Islands.

Of a shining semitransparent blue-white substance, with the remains of a slight epidermis about the sutures.

16. *HELIX CALIGINOSA*. Pl. XVI. Fig. 6. H. testâ subglobosâ, perforatâ, strigis obliquis elevatiusculis concentricè notatâ, lutescente-albâ, anfractibus sex, ultimo spadiceo-fusco, fasciâ angustâ rufâ circumdatâ, aperturâ depresso-lunatâ, peristomate reflexo.

HAB. Island of Mindanao, Philippines.

A striking new species, approaching the form of *H. unguilina*.

17. *HELIX DECORA*. Pl. XVI. Fig. 7. H. testâ conoideo-globosâ, imperforatâ, pallidè stramineâ, epidermide spadiceâ obtectâ, obliquè striatâ, anfractibus quatuor, planiusculis, ultimo subcarinato, aperturâ lunato-orbiculari, intus albâ, peristomate reflexo, intus albo, nitente.

HAB. Island of Mindoro, Philippines.

A smooth solid shell, of a delicate shining straw-colour beneath, whilst the upper surface is covered with a fawn epidermis.

18. *HELIX DENSA*. Pl. XVI. Fig. 8. H. testâ subdiscoideâ, perforatâ, densâ, obtusè carinatâ, supernè depressiusculâ, obliquè plicato-striatâ, undique eximiè corrugatâ, fulvescente, infra carinam fasciâ latâ castaneâ circumdatâ, anfractibus quinque, aperturâ transversè lunatâ, intus albâ, peristomate simplici, intus subincrassato.

HAB. Philippine Islands.

Approaching the form of *H. citrina*, from which it differs in being of stouter growth, and having the surface delicately corrugate throughout.

19. *HELIX PLURIZONATA*. Pl. XVI. Fig. 9. H. testâ subglobosâ, obtectè perforatâ, albâ, maculis pallidè fuscis nubeculatâ, striato-rugosâ, fasciis plurimis spadiceis et purpurascensibus cinctâ, anfractibus quatuor, convexis, ultimo rotundato, aperturâ lunato-transversâ, intus fuscâ, peristomate valdè reflexo, albo, margine inferiore subcalloso.

HAB. Island of Mindanao, Philippines.

The stripe-bands which encircle this very characteristic species are mingled irregularly fawn and purple-black.

20. *HELIX CANESCENS*. Pl. XVI. Fig. 10. H. testâ globosâ, subobtectè perforatâ, opaco-albâ, strigis obliquis lineisque plurimis concentricis nigricantibus interruptis fasciâque conspicuâ centrali ornatâ,

anfractibus quinque, ultimo rotundato-inflato, aperturâ lunato-rotundatâ, peristomate intus incrassato, in margine columellari calloso.

HAB. Africa. *Lower Calan = areolata* *Sby. var.*

A white globose shell, with simple lip banded and minutely sprinkled with black.

21. *HELIX CONOIDALIS*. Pl. XVI. Fig. 11. H. testâ orbiculato-conoideâ, subobtectè perforatâ, supernè elevatâ, basi convexâ, radiatim striatâ, pallidè rufescente, anfractibus quinque, supernè marginatis, reticulato-striatis aut corrugatis, rufo-violescentibus, ultimo fasciâ angustâ castaneâ circumdato, peristomate simplici, vix incrassato.

HAB. Island of Mindoro, Philippines.

Distinguished chiefly in form by its concave base and conoid manner of convolution above.

### NUCLEOBRANCHIATA.

#### 53. *CARINARIA*, Lamarck.

1. *CARINARIA ATLANTICA*. Pl. XIII. Fig. 12. Body elongated, subcylindrical, smooth; head tumid, rather elevated in front; eyes behind the tentacles on the upper part of the head; tentacles small, aciculate; proboscis rather large, furnished at the extremity with curved hooks; fin sharply triangular, sucker linear. Shell small, compressed, with the keel broad and prominent.

HAB. North Atlantic Ocean.

Numbers of this species were taken at twilight in the trawl, swimming in company with *Firolæ*. They were observed to progress with their body straightened, darting through the water with great rapidity.

### PLEUROBRANCHIATA.

#### 54. *APLYSIA*, Linnæus.

1. *APLYSIA LINEOLATA*. Pl. XVII. Fig. 1. *Aplys.* dorso convexo, posticè acuminato, pallidè viridi, lineis nigricantibus anastomotice oculisque compluribus ornato, oculis pupillo nigro, iride vividè violaceâ.

HAB. Mauritius.

This elegant species is remarkable for the acuminate form of its caudal extremity, and for the slenderness of the posterior tentacles.

2. *APLYSIA FIMBRIATA*. Pl. XVII. Fig. 2. *Aplys.* tentaculis anterioribus fimbriâ latâ margine sinuatâ ab exteriori tentaculi parte ad capitis latus pertinet, tentaculis posterioribus ad apicem inclinatis et in margine acuto inclinato altè incisis, obscure subviridi, ocellis permultis pupillo minuto albo, iride fuscâ, lineis nigris anastomotice ornatâ, punctis minutis opacis albis pictâ.

HAB. Ty-pin-san, Meiacoshima Islands.

Inner surface of foot, when seen expanded, marbled with black and white.

This large and handsome species is remarkable for the dilated and fringed anterior tentacles, and for the peculiar notched and inflexed character of the posterior tentacles. It was found crawling among the *Fuci*, in small pools left by the receding tide, on the flat coral shores of Ty-pin-san, one of the Meiacoshima group.

3. *APLYSIA OCULIFERA*. Pl. XVII. Fig. 3. *Aplys. sordidè viridi, ocellis pupillo lutescente, iride fuscâ, punctis lutescentibus albisque in nubeculis dispositis ornatâ.*

HAB. Mauritius.

The beautiful eye-like spots render the appearance of this species very elegant; the posterior tentacles are subulate and acutely pointed.

The *Aplysia punctata* of Philippi is marked with congregated dots in the same manner, but it wants the ocelli; the *Aplysia Argus* of Rüppell has the body covered with numerous ocelli, without the clusters of dots.

4. *APLYSIA NODIFERA*. Pl. XVIII. Fig. 7. *Aplys. sordidè olivaceâ, tuberculis elevatis compluribus subdistantibus obtectâ, maculis pallidè violaceis sparsis pictâ, pede maculis fuscis ornatâ, margine serie macularum albarum circumdatâ.*

HAB. Mauritius.

The row of white spots round the margin and numerous pale violet spots on the sides are striking characters of this species.

## 55. SIPHONOTUS, n. g.

Corpus elongatum. Branchiæ pallio testâque tectæ. Pes lateribus in lobos natantes dilatatis. Orificium respiratorium in siphonem prolongatum. Testa submembranacea.

Body elongated. Gills covered by the mantle and shell. Foot with the sides dilated into swimming lobes. Respiratory orifice prolonged into a siphon. Shell nearly membranaceous.

1. *SIPHONOTUS GEOGRAPHICUS*. Pl. XVIII. Fig. 1. Siphon. albo-fusco, punctis multis nigris et maculis magnis reticulatis viridibus albo-marginatis, superficie inferiore pedis vividè flavâ, palli siphone longo, cylindrico, pyramidato.

HAB. Java Sea, among masses of floating *Fuci*.

Whitish-brown, covered with minute dark specks, and large, irregular, green, reticulated patches, margined with opaque white; under surface of foot of a bright yellow, left side of foot with a projecting lobe which overlaps that of the opposite side; siphon of the mantle prolonged into a tapering, subcylindrical tube.

This form of *Aplysiadæ* belongs to a group indicated, but not named, by M. Rang, in which the margin of the mantle is posteriorly produced into a more or less elongated siphonal tube, instead of forming a simple aperture as in other species.



The species figured was captured off Java, among a mass of floating sea-weed, and, from being in a languid state, the tentacles are not fully extended.

### 56. DOLABELLA, *Lamarck*.

1. DOLABELLA RUMPHII. Pl. XVIII. Fig. 4. Lamarck, Anim. sans vert. (Deshayes' edit.) vol. vii. p. 699.

This fine species of *Dolabella* was collected at Mauritius, feeding in groups of eight or nine in a small muddy inlet of the sea. The colour of the specimens varied from dark green to dirty yellow.

### 57. BULLA, *Klein*.

1. BULLA COREANICA. Pl. XVIII. Fig. 3. Adams, Sowerby Thesaurus Conch. *Bull.* pl. 125. f. 166.

HAB. Corean Archipelago.

This species belongs to that division in which the shell is internal, and, when alive, presents a quadrilobate fleshy mass without any great amount of vivacity. There are no visible eyes or tentacles, and its elongated head probes with its extremity the mud-flats on which the species abounds, for the small bivalves which seem to constitute its food. Some of the large mud-flats among the Corean islands were covered with these shapeless mollusks, and offered tempting morsels to the Gallatorial birds seen striding over the mud.

2. BULLA VEXILLUM. Pl. XIX. Fig. 4. Chemnitz, Conch. Cab. vol. x. pl. 146. f. 1348, 9. *Bulla fasciata*, Bruguière.

HAB. Mindoro Sea, Philippine Islands.

The animal of *Bulla vexillum* is of a delicate pink colour, with the head, lobes, and margins of the foot edged with white, with an intramarginal dark chocolate-red border. The foot is thin, nearly membranous, and very voluminous, and, when not dilated for swimming, folded up around the shell; the inner margin of the mantle forms a thick fleshy lobe, which partially fills up the hind part of the aperture of the shell; the outer margin is thin and lines the outer lip. This *Bulla*, so beautiful in the living state, was found in grass-like sea-weed, in about a fathom water, near Ambolan, Mindoro.

3. BULLA SOLUTA. Pl. XVIII. Fig. 2. Chemnitz, Conch. Cab. vol. x. pl. 146. f. 1359, 1361. *Bulla Ceylanica*, Bruguière.

HAB. Borneo.

The *Bulla soluta*, Chemn., appears to be blind, while the head is very elongated, and the side lobes of the foot well developed for swimming,—which faculty, indeed, this form enjoys in great perfection. The inner or thickened edge of the mantle sends off

from the hind margin numerous horny setæ, or fine bristles, which are protruded through the fissured suture of the shell, the use of which, however, I have been unable to ascertain.

4. *BULLA VOLUTA*, Pl. XVIII. Fig. 5. Quoy and Gaimard, Voy. de l'Astrolabe, pl. 26. f. 33-35.

HAB. China Sea, in mud and debris at ten fathoms.

In *Bulla Voluta* the eyes are visible at the sides of the head, but the foot is narrow, and without the usually swimming side lobes. It is extremely slow in its movements, and is an inhabitant of deep water. Most of the specimens procured by us were dead shells, being bored by some carnivorous mollusk, showing the number of its enemies.

### 58. PLEUROBRANCHUS, *Cuvier*.

1. PLEUROBRANCHUS LUNICEPS, Pl. XVIII. Fig. 6 *a, b*. Cuvier, Règne Anim. *Pleur.* f. 6 *a, b*.

We have given a coloured figure of this beautiful species, which is very remarkable for its depressed, almost foliaceous body, and broad semilunar head. The proboscis is retractile when the animal is lively, but is protruded to its full extent before death. The dorsal tentacles are abruptly truncate at the ends, and the hind part of the mantle is produced into a siphonal inflexion, which guides the water into the marginal groove between the dilated foot and mantle, where the branchial plume is situated.

### NUDIBRANCHIATA.

Among the naked-gilled Gasteropods with which the equatorial seas abound, there are very many forms which are not referable to any hitherto recognized genera, but which the industry of future years will demonstrate: the two types here named *Bornella* and *Ceratosoma* are of this class, and drawings were made of some others; the species of *Scyllæa* and two species of *Goniodoris* we have likewise regarded as new.

### 59. BORNELLA, *Gray*.

Corpus elongatum, compressum, semipellucidum, posticè acuminatum, ventriculo ramoso in appendicibus dorsalibus extendens. Caput appendicibus duabus stellatis aut fimbriatis. Tentacula dorsalia retractilia in vaginulibus ramosis. Appendices dorsales in serie unicâ ad utrumque latus corporis dispositæ, cylindricæ, curvatæ, conicæ, bifidæ, trifidæ, aut simplices; branchiæ bipinnatæ, appendicibus dorsalibus exeuntes. Pes linearis, sulcatus.

The authors proposed to found a genus for these mollusks and had them figured for that purpose, but were anticipated by Mr. Gray, into whose possession the drawings had previously passed in their way from the Admiralty.

1. *BORNELLA DIGITATA*. Pl. XIX. Fig. 1. Born. corpore carneolo, lineis carmineis infra reticulatis transversim striato, appendicibus dorsalibus elongatis, bifidis aut trifidis, in apicibus conicis carmineis terminatis, branchiis ab parte superiore appendicibus dorsalibus exsertis, pede albo.

HAB. Straits of Sunda.

This species was found adhering to floating *Fuci*: it crawls briskly, and when detached swims by lateral inflexions of the body.

2. *BORNELLA ADAMSII*. Pl. XIX. Fig. 3. Gray, Mrs. Gray's Figures of Molluscous Animals, p. 107. Born. corpore carneolo, lineis carmineis infra reticulatis transversim striato, appendicibus dorsalibus elongatis, simplicibus aut bifidis, in apicibus carmineis terminatis, branchiis ab parte inferiore appendicibus dorsalibus exsertis, pede stramineo.

HAB. Coast of Borneo.

Like the preceding species, this also was found adhering to the stems of a mass of floating *Fuci*, clinging to them by its narrow grooved foot.

These handsome Nudibranchs, which are figured of the natural size and colour, resemble *Dendronotus* of Alder and Hancock in their dorsal tentacles being branched at the ends, in their ramifying digestive apparatus, and in their back being furnished with cylindrical branching processes arranged in a single row on each side; but the existence of distinct gills, arising, as in *Scyllæa*, from the dorsal appendages, at once distinguishes them. They seem to form a connecting link between the *Tritoniadæ* and the *Eolididæ*.

#### 60. SCYLLÆA, *Linnaeus*.

1. *SCYLLÆA GRAYÆ*. Pl. XIX. Fig. 2. Scyl. corpore flaveolo, punctis compluribus parvis fuscis et maculis majoribus fulvis, in lateribus notis ovalibus albis serie curvatâ ornato, lineâ latâ turbidè viridi maculis viridioribus in parte inferiore, in utroque laterc unâ notâ ultramarinâ, tentaculis luteolis, marginibus flavis et roseis, appendicibus dorsalibus liberis, extremitatibus vividè flavo-marginatis, lateribus notis parvis viridibus pictis.

HAB. North Atlantic Ocean.

We have dedicated this species of *Scyllæa* to Mrs. Gray, a lady to whom all who desire to study the nature of Molluscous animals are highly indebted for having presented them with outlines of the figures of this class, hitherto contained in expensive and generally inaccessible works.

#### 61. CERATOSOMA, n. g.

Caput magnum, anticè rotundatum, proboscide retractili, appendicibus lateralibus cylindricis, truncatis; velum nullum. Tentacula dorsalia claviformia, non retractilia, apicibus laminatis, e tuberculis rotundatis orientia. Corpus oblongum, angustatum, posticè acuminatum: appendices dorsales duæ, conicæ, anteriores ante aperturam branchialem, breves, rotundatæ, posteriores post aperturam branchialem, elevatiore,

permagnæ, curvæ, cornutæ. Branchiæ ramosæ, e stirpe communi orientes, in ramos quinque bipinnatos divisæ. Pes angustus, linearis.

1. CERATOSOMA CORNIGERUM. Pl. XIX. Fig. 5. Cerat. testâ stramincâ, carmineo vividè marmoratâ, infrâ evanidâ, margine inferiore albâ, maculis cæruleis in serie longitudinali dispositis, appendice dorsali anteriore maculis cæruleis ornatâ, vertice capitis maculis cæruleis in serie transversâ dispositis ornato.

HAB. Sooloo Sea.

This genus differs from *Polycera*, as defined by Cuvier, in wanting the frontal veil, in the surface of the body being smooth, in the possession of but two simple horn-like tubercles, and in the dorsal tentacles being swollen at the base; the two cylindrical, truncate labial appendages are also peculiar. In the figure the proboscis is represented as exerted, giving a peculiar character to the head, which it does not possess in the ordinary passive condition.

## 62. GONIODORIS, *Forbes.*

1. GONIODORIS TRILINEATA. Pl. XVII. Fig. 4 and 4 a. Gon. capite sub fronte pallii celato, sub-roseo, tentaculis dorsalibus vividè luteis; corpore pallidè roseo, margine cyaneo, in medio signo triangulari et notis duabus rotundis in utroque latere superficiei superioris ad partem posteriorem quæ ultra pallium pertinet; pallio roseo-purpureo, margine pallidè ultramarino, lineis tribus flavis, mediâ anticè claviformi, posticè bifurcatâ ut anum includat, lateralibus ad annulum branchialem curvaturâ desinentibus; branchiis septem, parvis, acuminatis, vividè flavis, circum anum dispositis, simpliciter pinnatis; pede lato, pallidè roseo.

HAB. China Sea.

This, though a small species, is very elegantly coloured, and is among the most beautiful of a group which contributes, by its variety of form and colour, to enliven the solitudes of the ocean.

2. GONIODORIS WHITEI. Pl. XIX. Fig. 6. Gon. corpore luteo, margine ultramarino, pallidis notis ovalibus distinctis, duabus longis paulo curvatis roseis lineis in utroque latere, lincis septem roseis retro et infra pedem pertinentibus, lineâ roseâ unâ ad superiorem partem corporis quæ ultra pallium pertinet; pallio anticè longissimè producto atque dilatato, margine libero, rotundato, vividè luteo, compluribus notis ovalibus pallidè luteis, tæniis quatuor pulehris liliaceis in dorso paribus intervallis dispositis, margine vivide ultramarino, lunulâ roseâ inter tentacula; tentaculis dorsalibus luteis, summo axe productis, acuminatis, albis; branchiis quatuordecim, simpliciter pinnatis.

HAB. Caramata Passage, near Biliton.

The figures that most nearly resemble this beautiful species, which we have dedicated to our zealous friend Mr. Adam White, are the *Doris magnifica* of Quoy and Gaimard (Voy. Astrol. t. 20. f. 1) and an unnamed *Doris*, marked "Banks, Icon. ined. 25, Endeavour River," represented in Mrs. Gray's work on Molluscous Animals.

## CERVICOBRANCHIATA.

63. HALIOTIS, *Linn.*

1. HALIOTIS VENUSTA. Pl. XIII. Fig. 5 *a, b*. Hal. testâ ovatâ, depresso-planâ, spiraliter tenuicostatâ et striatâ, costis distantibus nodulosis, foraminibus subprominentibus; lactcâ, vividè coccineo variegatâ, intus argenteâ.

HAB. Eastern Seas.

Richly variegated with bright vermilion scarlet, upon a white ground, and faintly tinged at the apex with purple.

64. SIPHONARIA, *Sowerby.*

1. SIPHONARIA COREENSIS. Pl. XIII. Fig. 1 *a, b*. Siph. testâ ovatâ, valdè depressâ, apice centrali, cinereâ, lineis undulatis rufescentibus radiatim dispositis, costis prominentibus, interstitiis plicatis, margine acutè dentato; intus flavescente, radiis albis pictâ, centro margineque castaneis.

HAB. Korean Archipelago.

A prettily-coloured species, with the siphonal impression strongly marked.

2. SIPHONARIA RADIATA. Pl. XIII. Fig. 2 *a, b*. Siph. testâ convexo-depressâ, apice centrali, oblongo-ovatâ, flavescente, costis lineisque rugoso-radiatis, margine crenato; intus brumeâ, radiis numerosis nigris et albis prope marginem tinctâ.

HAB. China Sea.

The black and white rays around the internal margin are frequent and the crenulations fine.

65. EMARGINULA, *Lamarck.*

1. EMARGINULA CLATHRATA. Pl. XI. Fig. 6. Emar. testâ ovato-oblongâ, conicâ, costis longitudinalibus lineisque transversis clathratâ, vertice elato, postico, uncinato; intus intensè viridi, margine crenulato.

HAB. Mindoro Sea.

A deeply-latticed high conical shell, of a peculiar blue-green colour in the interior.

66. PILEOPSIS, *Lamarck.*

1. PILEOPSIS ASTERICOLA. Pl. XI. Fig. 1. Pil. testâ acuminato-conicâ, curvatâ, vertice minutè convolutâ, radiatim creberrimè sulcatâ, margine crenulato; albâ.

HAB. Sooloo Sea, on the tubercle of a Star-fish.

This very interesting species, of which only a single example was collected, is very neatly sculptured throughout with fine close-set grooves radiating from the apex.

67. FISSURELLA, *Lamarck*.

1. FISSURELLA EXCELSA. Pl. XI. Fig. 5. Fiss. testâ elevato-conicâ, costis grandibus inæqualibus subsquamatis rudè elathratis, margine crenulato, orificio parvo, subrotundato, posticè inclinato; albidâ aut virescente.

HAB. China Sea.

Mainly distinguished by its high conical form.

68. CALYPTRÆA, *Lamarck*.

1. CALYPTRÆA TRIGONALIS. Pl. IX. Fig. 7 *a, b*. Calyp. testâ trigono-ovatâ, profundè convexâ, apice uncinatâ, radiatim subtiliter plicato-corrugatâ, cyatho amplo; albidâ, lincis fuscis peculiariter reticulatâ.

HAB. China Sea.

The principal distinguishing features of this species are its triangular compression, which is alike in all the specimens and not occasioned by any circumstances of attachment. There is, also, a peculiarity in the reticulated marking which shows more or less distinctly a radiate series of uncoloured patches, ranging like a frill around the apex.

2. CALYPTRÆA DEPRESSA. Pl. XI. Fig. 2 *a, b*. Calyp. testâ suborbiculari, depresso-conicâ, albâ, semipellucidâ, trilaminatâ, apice subcentrali, obtuso, radiatim corrugato-striatâ, cyatho crescentiformi, acuto, prominente.

HAB. China Sea.

This species is composed of three laminæ lying one upon the other after the manner of *C. tectum-Sinense*, but compressed closely one upon the other.

3. CALYPTRÆA PLANA. Pl. XI. Fig. 3. Calyp. testâ suboblongâ, depresso-convexâ, sellæformi, albâ, concentricè subtilissimè lineatâ, apice laterali, cyatho amplo, plano-laminato, ad latus emarginato.

HAB. China Sea, adhering to the interior of dead shells.

A flattened species, turned as it were inside outwards, and well characterized by the term saddle-shaped. *Type of Ergacea N. & A. N. 2, 1854*

4. CALYPTRÆA CANCELLATA. Pl. XI. Fig. 4. Calyp. testâ orbiculari, irregulari, conicâ, apice sub-laterali, retrorsum curvato, radiatim longitudinaliter costatâ, costis rugosis, medio sulcatis, interstitiis cancellatis, cyatho crescentiformi, prominulo.

HAB. China Sea.

Sculptured throughout with radiating ribs, down the middle of which there is for the most part a fine groove.

## CIRROBRANCHIATA.

## 69. DENTALIUM.

1. *DENTALIUM FORMOSUM*. Pl. V. Fig. 1 *a, b*. Dent. testâ arcuatâ, tumidiusculâ, tredecim-costatâ, costis rotuudatis, interstitiis latiusculis, extremitate posticâ dorsali fissuratâ, fissurâ apicem versus latiore; roseo, olivaceo-viridi et albo pulcherrimè variegatâ.

HAB. Sooloo Archipelago (outside a coral reef near the city of Sooloo, in about sixteen to twenty fathoms, sandy mud).

A beautiful addition to a genus rarely distinguished by any brilliancy of colour beyond the well-known green of the *D. elephantinum* and *aprinum*. It is of rather lighter and more tumid growth than the former, richly variegated with rose, olive-green, and a little white.

## III. BRACHIOPODA. 1850

## 70. TEREBRATULA.

1. *TEREBRATULA JAPONICA*. Pl. XXI. Fig. 1. Ter. testâ elongato-ovali, tumidâ, lævi, fragili, pellucido-albâ, anticè semicostatâ, costis posticè evanidis, valvis subæqualiter convexis, margine ventrali vix sinuato, crenulato, foramine parviusculo, rotundato.

HAB. Seas of Japan.

A semitransparent-white species, radiately finely ribbed towards the beaks, the ribs soon fading away.

2. *TEREBRATULA ANGUSTA*. Pl. XXI. Fig. 2. Ter. testâ elongato-ovali, subcompressâ, pellucido-albâ, longitudinaliter densè et subtilissimè costellatâ, costellis rugulosis, rostro truncato, valvis ferè æqualibus, medio leviter sulcato-depressis, margine ventrali, subsinuato.

HAB. Seas of Japan.

An extremely delicately-sculptured oblong species, allied to *T. caput-serpentis*.

3. *TEREBRATULA COREANICA*. Pl. XXI. Fig. 3. Ter. testâ rotundato-triangulari, lævi, carneolâ, radiatim carmineo fasciatâ, fasciis irregularibus, interruptis, valvâ dorsali convexâ, medio subcarinatâ, ventrali planiore, latera versus subcompressâ, foramine amplo ovali, utroque latere subangulato.

HAB. Corean Archipelago.

A smooth species, delicately painted with irregular crimson-scarlet rays.

4. *TEREBRATULA CAPENSIS*. Pl. XXI. Fig. 4. Ter. testâ subtriangulari, longitudinaliter costatâ, crassiusculâ, coccineo vividè radiatâ, valvis conspicuè sinuatis et sulcatis, foramiue subamplo.

HAB. Cape of Good Hope.

An interesting small species, dredged off the Cape of Good Hope at a depth of 120 fathoms.

5. *TEREBRATULA ABYSSICOLA*. Pl. XXI. Fig. 5. Ter. testâ trigono-ovali, pellucido-carneolâ, læviusculâ, radiatim planicostatâ et striatâ, costis striisque ferè obsoletis, valvis ferè æqualiter convexis, medio leviter sinuato-sulcatis.

HAB. Cape of Good Hope, 120 fathoms.

Dredged with the preceding species, but very different in character, and belonging more to the type of *T. caput-serpentis*.

#### IV. LAMELLIBRANCHIATA.

##### 1. OSTRACEA.

###### 71. OSTREA, *Linnaeus*.

1. *OSTRÆA PYXIDATA*. Pl. XXI. Fig. 19. Ostr. testâ orbiculari, inæquivalvi, valvâ sinistrâ planâ, radiatim costatâ, costis nodulosis, dextrâ convexâ, radiatim valdè costatâ, costis nodulosis sæpè duplicatis, margine ventrali crenulato; sordidè fuscâ.

HAB. Philippine Islands.

This singular species appears to be characterized by having the right valve extremely convex, and the left one flat.

##### 2. PECTINACEA.

###### 72. HEMIPECTEN, n. g.

Testa adhærens, inæquivalvis, irregularis, hyalina, valvâ superiore anticè simplici, posticè vix auriculatâ, valvâ inferiore anticè simplici, posticè conspicuè auriculatâ, infra auriculam profundè sinuatâ et denticulatâ; cardine edentulo, ligamento leviter marginali, cartilagine parvo in cavitatem centalem.

This interesting shell is intermediate in its characters between *Pecten* and *Anomia*. Like *Anomia* it is a thin hyaline substance, adhering to some foreign body, and of an irregular growth, according to the inequalities of its place of attachment. Like *Pecten* the hinge consists of a slight marginal ligament, intersected in the middle by a small triangular cartilage, situated in the hollow of a superficial cavity in each valve. The under valve is distinguished by a conspicuous auricle on the posterior side, and beneath this is a sinus so deeply cut in the direction of the hinge-margin as to remind one of *Pedum*, especially when presented with the under valve closed upon the hollow of the upper one, as in Fig. 1 *b*, 2 *b*; and the margin of this sinus, as indicated in some of the *Pectens*, is furnished with a row of sharp erect denticles. The shell bears some resemblance to *Pedum*, from the circumstance of there being no corresponding sinus in the upper valve; but it is apparently only a character of resemblance, not one of affinity. The shell has no umbonal area; nor are the sides of either valve reflected.



The observations to be derived from the microscopic structure of *Hemipecten*, which has been kindly exhibited to us by Dr. Carpenter, are, however, singularly contradictory to the views presented by its external characters. Of the two specimens collected, the texture and composition of both valves consist of a hyaline semi-pearlaceous lamina, presenting a series of closely-packed concentric lines, the interstices of which are minutely rayed with much finer lines. Submitted to the microscope, the flat valve in both specimens (Fig. 1 *a*, 2 *d*) is permeated by copious tubuli, a character in which the genus agrees with *Pedum* and with some species of *Lima*, and differs from *Pecten*. This tubularity Dr. Carpenter observed to exist also in the upper valve of the colourless specimen (Fig. 1 *c*), but not in the other (Fig. 2 *c*), so far as the Bryozoon upon its surface allows of an examination.

The upper valve of the coloured specimen (Fig. 2 *c*) possesses a rudimental sculpturing over its entire surface; but as it may have received this from the parasite, and exhibits no other appreciable point of difference, we have not ventured to distinguish it specifically from the white specimen.

1. HEMIPECTEN FORBESIANUS. Pl. XX. Hemip. testâ orbiculari, Anomiaeformi, tenuissimâ, hyalinâ, concentricè lineatâ, linearum interstitiis eximiè reticulatis, valvâ inferiore planulatâ, auriculâ longitudinaliter radiatâ, sinn profundo, valvâ superiore convexâ, vix auriculatâ; pellucido-albâ, valvâ superiore interdum rufo-aurantio radiatâ.

HAB. Sooloo Archipelago, Eastern Seas (dredged from a coral and stony bottom at a depth of about fourteen fathoms); Belcher.

Two specimens of this interesting new form were collected during the voyage, one smooth and white, the other slightly sculptured in a decussately corrugated style, probably from the effect of the Bryozoon which covers it, and rayed with orange-red. The under valve is smooth in both specimens, showing it to have been attached; the upper valve is more or less covered in both with various parasitic objects.

We have the pleasure to name the species in honour of Professor Edward Forbes, who notices the genus, in his valuable work on the British Mollusca, as affording a curious intermediate link between *Pecten* and *Anomia*.

PLATE XX. Fig. 1 represents the smooth colourless specimen; *a*, interior of the under valve; *b*, the valves closed, presenting the exterior of the under valve; *c*, the valves closed, presenting the exterior of the upper valve. Fig. 2 represents the coloured and slightly corrugated specimen; *a*, interior of the upper valve, which is not shown of the former specimen; *b*, the valves closed, presenting the exterior of the under valve; *c*, the valves closed, presenting the exterior of the upper valve; *d*, interior of the under valve:—*all of the natural size.*

### 73. PECTEN, *Bruguère.*

1. PECTEN REEVEI. Pl. XXI. Fig. 10 *a*, *b*. Pect. testâ æquivalvi, subæquilaterâ, suborbiculari, paululum longiore quam altâ, albâ, carmineo vividè variegatâ et radiatâ et violaceo maculatâ; costatâ, costis

ad viginti, latiusculis, lincis concentricis elevatis minutè et densissimè decussatis, auriculis subæqualibus, intus vividè carmineâ et albâ. ADAMS, MS.

HAB. China Sea.

Several specimens of this magnificent new *Peeten* were collected in the China Sea, all more or less brilliantly coloured in the manner described.

2. PECTEN FULVICOSTATUS. Pl. XXI. Fig. 11. Pect. testâ subobliquâ, multò altiore quam longâ, inæquilaterâ, albidâ, rubro sparsim maculatâ, costis fulvis, valvis subæqualibus, tenuibus, compressis, decem-costatis, costis interstitiisque marginem versus elevato-striatis, auriculis valdè inæqualibus.

HAB. Sooloo Archipelago.

A very thin shell, rayed with ten broad yellowish ribs, very sparingly red-spotted.

3. PECTEN AURANTIACUS. Pl. XXI. Fig. 12. Pect. testâ oblongo-orbiculari, subæquilaterâ, peculiariter compressâ, valvâ superiore planatâ, inferiore subconvexâ, ambabus radiatim costatis, costis quatuordecim, rotundatis, sulcosi, squamis minimis per quatuor series longitudinales in costis dispositis, costarum interstitiis profundè excavatis, transversim striatis, vix auriculis inæqualibus; intensè aurantiâ, luteo et violacco maculatâ.

HAB. China Sea.

A truly beautiful species, characterized by the most elaborate and delicate sculpture, with brilliant colouring.

4. PECTEN ASPERULATUS. Pl. XXI. Fig. 13. Pect. testâ inæquivalvi, æquilaterâ, carneolâ, aureo variegatâ, rostris vividè rufis, liris numerosis, irregularibus, obsoletè squamulosis, asperulatis, auriculis valdè inæqualibus.

HAB. Corean Archipelago.

The auricles are remarkably unequal in this species, whilst the under valve has a row of denticles almost as strongly developed as in *Hemipeeten*.

5. PECTEN DENTICULATUS. Pl. XXI. Fig. 14. Pect. testâ elongato-ovatâ, subæquivalvi, æquilaterâ, tenui, compressâ, radiatim lirâtâ, liris valvæ superioris ad quindecim, alternatim minoribus, angustis, squamulis dentiformibus ornatis, valvæ inferioris permultis, squamulis aculeatis, scabris, auriculis inæqualibus, margine cardinali valvæ inferioris dentato, alterius simplici; pellucido-lutescente, rosaceo obsoletè tinctâ.

HAB. Shores of Borneo.

Rayed with narrow elevated ridges, surmounted with fine scales.

6. PECTEN CRISTULARIS. Pl. XXI. Fig. 15. Pect. testâ subæquivalvi, suborbiculari, paululum altiore quam longâ, pallidè carneâ, rubro variegatâ, costis quatuor et viginti, rotundatis, hic illic subtiliter squamatis, interstitiis lævibus, margine cardinali valvæ superioris simplici, inferioris cristato-crenato.

HAB. Eastern Seas.

Of very simple character, though not exactly agreeing with any hitherto described species.

74. LIMA, *Bruguère*.

1. LIMA BASILANICA. Pl. XXI. Fig. 6. L. testâ obliquè ovatâ, fragili, tumidâ, utroque latere subhiante, radiatim subtiliter costellatâ, transversim tenuissimè striatâ, cardinis areâ subobliquè lanceolatâ.

HAB. Island of Basilan.

A very delicately ribbed species, the ribs being devoid of any squamate sculpture.

2. LIMA ORIENTALIS. Pl. XXI. Fig. 7. L. testâ obliquè ovatâ, subangustâ, fragili, tumidâ, utroque latere hiante, radiatim subtiliter costellatâ, costellis numerosis, rugulosis, auriculis minimis, cardinis areâ obliquè lanceolatâ, margine ventrali dentato.

HAB. Philippine Archipelago.

Somewhat like the preceding species in general aspect, but of narrower form, whilst the ribs are finer, more numerous, and delicately rugose.

## 3. CHAMACEA.

75. CHAMA, *Linnæus*.

1. CHAMA LACINIATA. Pl. XXI. Fig. 20. Ch. testâ angustè ovatâ, albidâ, rufo variegatâ, longitudinaliter plicatâ, plicis conspicuè irregulariter squamatis, liris brevibus corrugatis obliquè decussatâ.

HAB. China Sea.

A rather compressed species, armed with bunches of vaulted scales, and fine transverse wrinkled ridges.

## 4. ARCACEA.

76. NUCULA, *Lamarck*.

1. NUCULA MIRABILIS. Pl. XXI. Fig. 8. Nuc. testâ transversè oblongâ, subtriangulari, anticè brevissimâ, concavo-truncatâ, epidermide virescente-luteâ indutâ, longitudinaliter utrinque costatâ, costis corrugatis, medio divaricatis.

HAB. Kieu-sieu, Nangasaki Bay, Japan.

This remarkable species partakes of the character of a very interesting type, only known hitherto in a fossil state.

2. NUCULA JAPONICA. Pl. XXI. Fig. 9. Nuc. testâ elongato-oblongâ, anticè longiore, subrostratâ, posticè tumidâ, rotundatâ, lævi, albidâ, epidermide lutescente-corneâ indutâ.

HAB. Kieu-sieu, Nangasaki Bay, Japan.

In this species, which more resembles the ordinary form of the genus, the anterior side is much the longer, produced, as it were, into a beak.

77. PECTUNCULUS, *Lamarck*.

1. PECTUNCULUS BELCHERI. Pl. XXII. Fig. 5. Pect. testâ obliquè ovatâ, depressâ, decussatim striatâ, latere antico brevi, postico multò longiore, dilatato, epidermide fuscâ, densè pilosâ, pilis in fimbriis concentricis dispositis.

HAB. Cape of Good Hope, 120 fathoms.

Remarkable for an epidermis of festoons of fringes.

2. PECTUNCULUS ASPERSUS. Pl. XXII. Fig. 8. Pect. testâ magnâ, orbiculari, subæquilaterâ, radiatim subtilissimè sulcatâ et striatâ, striis concentricis decussatâ, albidâ, rubro-fusco adpersâ, epidermide fusco-pilosâ partim obtectâ.

HAB. Sooloo Archipelago.

A fine new species, belonging to the same type of the genus as the well-known *P. pilosus*.

## 5. CARDIACEA.

78. CARDITA, *Bruguère*.

1. CARDITA FERRUGINOSA. Pl. XXI. Fig. 21. Card. testâ subcordatâ, compressâ, anticè truncatâ, albo et ferrugineo-rufo variegatâ, radiatim costatâ, costis ad quatuordecim, convexis, nodoso-striatis, interstitiis latiusculis.

HAB. Philippine Archipelago.

Of an unusually compressed growth, prettily variegated with light rust-colour.

79. HIPPIAGUS, *Lea*.

1. HIPPIAGUS NOVMCOSTATUS. Pl. XXIV. Fig. 1. Hip. testâ suborbiculari, cordatâ, radiatim fortiter costatâ, costis septem ad octo, distantibus, sub lente granulosis; sordidè fuscâ, intus argenteo-margaritaceâ.

HAB. China Sea.

A single valve of this remarkable genus, apparently recent, was dredged from among the debris of the China Sea. It is rayed with about seven to eight elevated ribs, covered with a very dark brown epidermis, bright silver-pearled within, and quite distinct from the fossil species, the only *Hippiagi* known, *H. Isocardioides*, Lea, and *H. acuticostatus*, Philippi.

80. ISOCARDIA, *Lamarck*.

1. ISOCARDIA TETRAGONA. Pl. XXII. Fig. 1. Isoc. testâ elongato-cordatâ, compressiusculâ, lacteâ, hic illic obsoletè rufescente, longitudinaliter plicatâ, plicis angulatis, latere postico acuminato-producto, carinâ acutâ, umbonibus confertis, minutis.

HAB. Japanese Seas.

A species of rather slight structure, distinguished by its remarkably elongated form, the posterior extremity being sharply acuminate.

2. *ISOCARDIA MOLTKIANA*. Pl. XXII. Fig. 3.

Two specimens of this beautiful red-spotted variety of the true *Chama Moltkiana* of Chemnitz were collected at Corea, both amply distinguished from the common species, *I. vulgaris*, by their solid cordate form and bold development of the ribs.

81. *CARDIUM*, *Linnaeus*.

1. *CARDIUM ADAMSI*. Pl. XXII. Fig. 2. Card. testâ subquadrato-cordatâ, posticè obliquè truncatâ, angulatâ, subæquilaterâ, albâ, rubro variegatâ, costis ad sex et triginta, elevatis, squamulis aculeatis confertis regularibus undique densè armatis. REEVE, MSS.

HAB. Shores of Borneo.

Several examples of this most exquisitely sculptured species were collected on the coast of Borneo.

2. *CARDIUM AURANTIACUM*. Pl. XXII. Fig. 4. Card. testâ subcordatâ, gibbâ, glabrâ, nitidâ, albo aurantiaco rubroque variegatâ, longitudinaliter striatâ, latere postico lævi, antico striis transversis concentricis elevatis subdistantibus exsculpto.

HAB. China Sea.

A fine species, allied to *C. pectinatum*.

3. *CARDIUM MODESTUM*. Pl. XXII. Fig. 6. Card. testâ subquadrato-cordatâ, tenuiculâ, flaveolâ, radiis tribus rufescentibus subobsoletè pictâ, radiatim subtilissimè et creberrimè costellatâ et concentricè striatâ, areâ posticâ subclathratâ, margine crenulato.

HAB. Eastern Seas.

A thin and minutely-sculptured species, comparatively smooth except on the posterior area.

4. *CARDIUM KALAMANTANUM*. Pl. XXII. Fig. 7. Card. testâ subcordatâ, gibbosâ, glabrâ, nitidâ, luteo-aurantiacâ, umbonibus rosaceo-albis, radiatim substriatâ, latere antico liris obliquis distantibus exsculpto, postico lævi, margine dentato.

HAB. Shores of Borneo.

Another species of the *C. pectinatum* type, apparently distinct from *C. aurantiacum*.

5. *CARDIUM SPECIOSUM*. Pl. XXII. Fig. 9. Card. testâ subcordatâ, crassiusculâ, tumidâ, posticè peculiariter concavo-truncatâ, albo rufoque tessellatâ, radiatim costatâ, costis ad sex et viginti, convexis, squamato-granulatis, interstitiis transversim striatis.

HAB. China Sea.

Very distinctly characterized from any species known hitherto.

6. *CARDIUM BECHEL*. Pl. XXII. Fig. 12. Card. testâ subcordato-ovatâ, medio et anticè lævigatâ, striis minutis superficialiis radiantibus et concentricis sub lente decussatâ, epidermide tenui cornèa nitente in funiculis fibrise concentricis creberrimè dispositâ, areâ posticâ, epidermide nullâ, radiatim costatâ, costis tenuibus, confertis, quinque et viginti ad triginta, spinis brevibus compressis densissimè seriatim ornatis; undique pulcherrimè roseâ, intus albâ.

HAB. Sooloo and Yellow Seas.

We have much pleasure in dedicating this species, at the desire of Capt. Sir Edward Belcher, to Sir Henry de la Beche, Director of the Ordnance Survey and President of the Geological Society. It forms a most interesting addition to the genus *Cardium*, and is, without exception, the most striking and distinct from any hitherto known that can well be imagined. In colour it is of a fine rose-tint, with the following singular contrast of character. The middle and anterior portion of the shell is smooth, presenting a peculiar soft velvety appearance, the effect of its being minutely decussated with concentric and radiating striæ, and covered with an exquisite thin shining horny epidermis, disposed in fine concentric cords, abruptly terminating at the posterior area. The posterior portion, accordingly destitute of epidermis, is very thickly rayed with ribs of short compressed spines, as if the delicately-clad surface of the shell had been thus far ploughed up, as it were, into furrows.

Only two odd valves of this pre-eminently beautiful shell were obtained, and, singularly, in localities very remote from each other: one was dredged at the depth of forty fathoms in the Sooloo Seas, between the islands of Borneo and Mindanao; the other in the Yellow Sea, thirty degrees north, at one of the islands of the Corean Archipelago.

## 6. CONCHACEA.

### 82. CYTHEREA, *Lamarck*.

1. *CYTHEREA VIRGINEA*. Pl. XXIV. Fig. 10. Cyth. testâ oblongo-triangulari, æquivalvi, crassiusculâ, cinerascence-albâ, nitente, radiatim obscure fasciatâ, latere postico lineâ impresso, areâ posticâ violascente. = *Tivela stultorum* *Mawe*. Cf. *Nautilus*, xxxv. p. 134, 1922.

HAB. ~~Eastern Seas.~~ *California*.

A very delicate and characteristic species, equivalve and of rather an oblong-triangular form.

### 83. ARTEMIS, *Poli*.

1. *ARTEMIS DUNKERI*. Pl. XXI. Fig. 17. Reeve, *Conch. Icon. Artem.* pl. 6. f. 34. *Cytherea Dunkeri*, Philippi, *Abbild. und Besch. Conch. Cyth.* p. 4. pl. 2. f. 5.

HAB. Eastern Seas.

We are anticipated in the publication of this fine species of *Artemis* by Dr. Philippi, who had already named it after Dr. Dunker of Cassel.

84. VENUS, *Linnæus*.

1. VENUS PHILIPPINARUM. Pl. XXII. Fig. 10. V. testâ oblongo-ovatâ, anticè truncatâ, fulvâ, fusco variegatâ, obscure radiatâ, radiatim liratâ, liris numerosis, subundatis, ad latera decussatim nodulosis; intus partim violaceâ.

HAB. Philippine Archipelago.

This and the following species belong to that section of the genus which partakes of the character of *Pullastra*.

2. VENUS TESSELLATA. Pl. XXII. Fig. 11. V. testâ oblongo-ovatâ, anticè truncatâ, crassiusculâ, fusco alboque strigatâ et tessellatâ, radiatim multiliratâ, transversim tenuissimè striatâ, lunulâ lauceo-lato-ovatâ.

HAB. Philippine Archipelago.

A dark ash-rust shell, beautifully mottled and streaked throughout with white.

3. VENUS LABUANA. Pl. XXI. Fig. 16. V. testâ subtriangulari, gibbosâ, anticè truncatâ, posticè flexuosâ, acuminato-rostratâ, albidâ, liueis nigricantibus acutè angulatis ornatâ, concentricè valdè sulcatâ, sulcis irregularibus, margine ventrali posticè sinuato.

HAB. Island of Labuan.

This fine species, though not apparently new, does not seem to have been described.

4. VENUS COSTELLIFERA. Pl. XXI. Fig. 18. V. testâ oblongo-ovatâ, subtrigonâ, subæquilaterâ, albâ, rubro sparsim variegatâ, longitudinaliter costatâ, costis confertis, decussatim plicatis, plicis semilunariibus, confertis, posticis squamulosis.

HAB. Philippine Archipelago.

Very closely ribbed, the ribs being densely sculptured throughout with close-set semilunar folds.

5. VENUS QUADRANGULARIS. Pl. XXIV. Fig. 7. V. testâ quadrato-ovatâ, subcompressâ, crassiusculâ, concentricè tenuiter et irregulariter striatâ, pallidè stramineâ, nitidâ, umbonibus roseis, latere antico brevi, postico multò longiore, lunulâ parum distinctâ.

HAB. Corean Archipelago.

Peculiarly square-formed, of a light shining straw-colour, with pink umboes.

6. VENUS ELEGANS. Pl. XXIV. Fig. 13. V. testâ oblongo-ovatâ, calcareo-albâ, lamellis concentricis subirregularibus ad latus posticum majoribus ornatâ, lunulâ cordatâ, parvâ.

HAB. Eastern Seas.

An elegantly-formed species, delicately sculptured with irregular concentric lamellæ.

## 7. NYMPHACEA.

85. LUCINA, *Bruguère*.

1. LUCINA FIBULA. Pl. XXIV. Fig. 5. Reeve, Conch. Icon. *Luc.* pl. 7. f. 33, 37, and 38.

HAB. China Sea.

There are two or three varieties of this species from very remote localities; in addition to that under consideration from China, Mr. Cuming possesses specimens from the Philippine Islands and from New Zealand.

2. LUCINA SERICATA. Pl. XXIV. Fig. 6. Reeve, Conch. Icon. *Luc.* pl. 9. f. 55.

HAB. Philippine Archipelago.

This and the preceding species were incidentally described and figured in the *Conchologia Iconica* whilst the accompanying plate was in the hands of the engraver.

86. CYRENOIDA, *Joannis*.

1. CYRENOIDA ALATA. Pl. XXIV. Fig. 12. Cyren. testâ rotundatâ, oblongâ, subæquilaterâ, utrinque productâ, tumidâ, sordidè albâ, epidermide luteâ partim indutâ, striis rugosis concentricè sculptâ, latere antico subangustato, rotundato, postico dilatato, subtruncato.

HAB. Corean Archipelago.

Remarkable for its produced growth at the sides.

2. CYRENOIDA COREENSIS. Pl. XXIV. Fig. 14. Cyren. testâ subquadrato-ovatâ, valdè æquilaterâ, subcompressâ, sordidè albâ, epidermide tenui indutâ, concentricè irregulariter rugoso-striatâ, latere antico brevi, lunulâ oblongâ, postico rotundato.

HAB. Corean Archipelago.

This species partakes more of the form and general character of *Lucina*.

87. PSAMMOBIA, *Lamarck*.

1. PSAMMOBIA DENTICULATA. Pl. XXIV. Fig. 2. Psam. testâ oblongâ, tenui, albâ, posticè angulatâ, ad angulum costatâ, costis muricato-squamatis, medio et latere antico peculiariter obliquè plicato-liratis, liris subindatis, per summitatem sulcatis.

HAB. China Sea.

Only a single valve of this remarkable species was collected.

2. PSAMMOBIA FLEXUOSA. Pl. XXIV. Fig. 3. Psam. testâ elongato-ovatâ, posticè rostratâ, albâ, obliquè



plicatâ, plicis undulato-corrugatis, hic illic duplicatis, latere postico rostrato, flexuoso, acuto, antico rotundato, umbonibus subacuminatis.

HAB. Shores of Borneo.

Strongly plicated obliquely, somewhat after the manner of the preceding species, but wanting the radiately-ribbed posterior area.

1. *PSAMMOBIA RUGULOSA*. Pl. XXIV. Fig. 4 *a, b*. Psam. testâ oblongâ, albâ, anticè rotundatâ, obliquè plicatâ, plicis tenuibus, confertis, undulatis, posticè vix angulatâ, costis radiantibus squamuliferis exsculptâ.

HAB. China Sea.

The oblique plaits are finer in this species, whilst the radiating ribs of the posterior side are rather strongly developed.

### 88. AMPHIDESMA, *Lamarck*.

1. *AMPHIDESMA EXARATA*. Pl. XXIV. Fig. 9. Amph. testâ oblongo-ovatâ, albâ, maculis perpaucis roseis pallidè adpersâ, concentricè costatâ, costis tenuibus, acutis, subrecurvis, interstitiis profundè excavatis, lineis pulcherrimè decussatis.

HAB. Sooloo Sea.

Well distinguished by its numerous delicately recurved concentric ribs.

2. *AMPHIDESMA SIMPLEX*. Pl. XXIV. Fig. 11. Amph. testâ ovatâ, crassiusculâ, subtrigonâ, concentricè tenuissimè striatâ, rosaceo-albâ, apicibus roseis, intus aureâ, latere postico breviorè, subflexuoso.

HAB. China Sea.

This species has very much the aspect of a small *Tellina*.

## 8. MACTRACEA.

### 89. MACTRA, *Linnaeus*.

1. *MACTRA THRACIOIDES*. Pl. XXIII. Fig. 8. Mac. testâ ovato-oblongâ, inæquilaterâ, tenui, opaco-albâ, concentricè plicatâ, plicis rotundatis, undulatis, corrugatis, obliquè striatis, latere postico longiore, subattenuato, latè hiante.

HAB. Eastern Seas.

This very curious species is quite an abnormal form of *Maetra*, having much the appearance of a *Thracia*.

### 90. CRASSATELLA, *Lamarck*.

1. *CRASSATELLA NANA*. Pl. XXIII. Fig. 2. C. testâ subtrigono-ovatâ, compressâ, concentricè sulcosâ, latere postico longiore, angulato, subflexuoso; brunneâ, rufescente obscure trifasciatâ.

HAB. Eastern Seas.

Several examples of this small species were collected at various localities in the Eastern Seas.

2. *CRASSATELLA PICTA*. Pl. XXIII. Fig. 6. Cras. testâ trigono-ovatâ, crassâ, gibbosâ, concentricè rudè plicatâ, plicis crassis rotundatis, virescente-albâ, radiis aut maculis duabus rufo-castaneis conspicuè pictâ.

HAB. Philippine Archipelago.

A stout solid shell characterized by two blotched red-chestnut rays on each valve.

3. *CRASSATELLA CORRUGATA*. Pl. XXIII. Fig. 7. Cras. testâ subtriangulâri, crassâ, gibbosâ, anticè declivi, rotundatâ, posticè angulatâ, rubro-castaneâ, obscurè radiatâ, concentricè peculiariter undato-plicatâ, plicis corrugatis.

HAB. Sooloo Sea.

Very distinctly characterized by the waved corrugated folds with which it is sculptured.

4. *CRASSATELLA PALLIDA*. Pl. XXIII. Fig. 9. Cras. testâ oblongâ, subtrigonâ, crassâ, latere postico multò longiore, obtusè angulatâ, antico brevi, concentricè profundè sulcatâ, sordide albâ, umbonibus rufescentibus.

HAB. China Sea.

The absence of dark colouring is very unusual in this genus.

5. *CRASSATELLA COMPRESSA*. Pl. XXIII. Fig. 10. Cras. testâ oblongo-ovali, valdè compressâ, latere antico rotundato, postico vix angulato, castaneo-brunneâ, concentricè plicato-sulcatâ.

HAB. Corcan Archipelago.

Remarkably compressed, with very simple sculpture.

## 9. MYARIA.

### 91. MYA, *Linnaeus*.

1. *MYA MINDORENSIS*. Pl. XXIII. Fig. 13. M. testâ ovato-oblongâ, subcompressâ, albâ, epidermide subfuscâ partim indutâ, latere antico rotundato, postico subtruncato.

HAB. Mindoro Sea.

This little shell appears to be a true adult *Mya*, though apparently young.

### 92. THRACIA, *Leach*.

1. *THRACIA GRANULOSA*. Pl. XXIII. Fig. 16. Thr. testâ ovato-oblongâ, subæquilatâ, albâ, undique minutè granulatâ, transversim obliquè plicatâ, plicis grandibus undulatis, ad latus posticum valvæ superioris obsoletis, latere postico subtruncato.

HAB. China Sea.

An extremely interesting addition to this very limited genus.

2. *THRACIA TRIGONALIS*. Pl. XXIV. Fig. 8. Thr. testâ trigono-ovatâ, subæquivalvi, irregulari, pellucido-albâ, concentricè elevato-striatâ, anticè rotundatâ, posticè angulato-flexuosâ, margine ventrali posticè sinuato.

HAB. Sooloo Archipelago.

We have some doubt of this being a true *Thracia*, but know not any genus to which it could be better referred.

### 93. CORBULA, *Lamarck*.

1. *CORBULA VENTRICOSA*. Pl. XXIII. Fig. 12. Cor. testâ subtrigono-ovatâ, ventricosâ, anticè rotundatâ, posticè paulum longiore, angulatâ, subtruncatâ, sordide albâ, epidermide fuscâ partim indutâ.

HAB. China Sea.

A very dull simple species, peculiar in form.

2. *CORBULA VARIEGATA*. Pl. XXIII. Fig. 14. Cor. testâ trigono-oblongâ, latere postico multò longiore, attenuato, rostrato, valdè angulato, concentricè plicato-costatâ, albâ, croceo et rufo-spadiceo variegatâ, margine ventrali incrassato, roseo maculato.

HAB. China Sea.

A very conspicuously painted species, of quite a different type from the preceding.

### 94. LYONSIA, *Turton*.

1. *LYONSIA NAVICULA*. Pl. XXIII. Fig. 11. Lyon. testâ oblongâ, gibbâ, tenui, fragili, anticè rotundatâ, posticè compressiusculâ, subtruncatâ, hiantè, radiatim striatâ et obscure lirâtâ, liris distantibus, epidermide flaveolâ, margine ventrali flexuoso.

HAB. Shores of Borneo (dredged from a depth of about eleven fathoms).

A fine characteristic species, of which only a single specimen was collected.

### 95. POROMYA, *Forbes*.

1. *POROMYA PULCHELLA*. Pl. XXIII. Fig. 1. Por. testâ oblongo-ovatâ, tenui, fragili, albâ, pellucidâ, nitente, concentricè plicatâ, plicis obtusis, subdistantibus, anticè rotundatâ, posticè attenuatâ, rostratâ.

HAB. Shores of Borneo.

A very delicate transparent species, of which many were collected on the coast of Borneo.

2. *POROMYA NITIDA*. Pl. XXIII. Fig. 3. Por. testâ subgloboso-trigonalis, albâ, semipellucidâ, lævi, nitidâ, latere antico rotundato, postico acutè acuminato-rostrato, concentricè sulcato, radiatim impresso, ad marginem angulato, umbonibus plicato-sulcatis.

HAB. Shores of Borneo.

A smooth species, very sharply beaked on the posterior side.

#### 96. NEÆRA, *Gray*.

1. NEÆRA MOLUCCANA. Pl. XXIII. Fig. 4. N. testâ tenui, ovatâ, posticè in rostrum angustum elongatum productâ, albâ, concentricè obliquè plicatâ, plicis undulatis.

HAB. Islands of the Molucca, Gillolo.

An interesting elongately-beaked species, oblique wave-plaited across, after the manner of the *Psammobiæ*.

### 10. SOLENACEA.

#### 97. SOLEN, *Linnæus*.

1. SOLEN ALBIDA. Pl. XXIII. Fig. 15. Sol. testâ oblongâ, utrinque rotundatâ, tenui, fragili, albidâ, striis confertis concentricis, posticè latè hiante.

HAB. Corean Archipelago.

Very simply characterized, white, with a very light horny epidermis.

### 11. PHOLADARIA.

#### 98. PHOLAS, *Linnæus*.

1. PHOLAS RIVICOLA. Pl. XXIII. Fig. 5. (Sow. Thes. pl. cviii. f. 90, 91.) Phol. testâ clausâ, cunei-formi, canali transversè divisâ, parte anticâ obliquè dimidiatâ, latere dorsali striato, latere ventrali lævi, subangulato, parte posticâ subelongatâ, lævi, epidermide laminis angulatis marginibus serratis ornatâ, laminâ dorsali subquadratâ, in medio longitudinaliter divisâ.

HAB. Found burrowing in floating logs used as landing places at Gunung Taboor, twelve miles up the Pantai river, where the water was perfectly fresh.

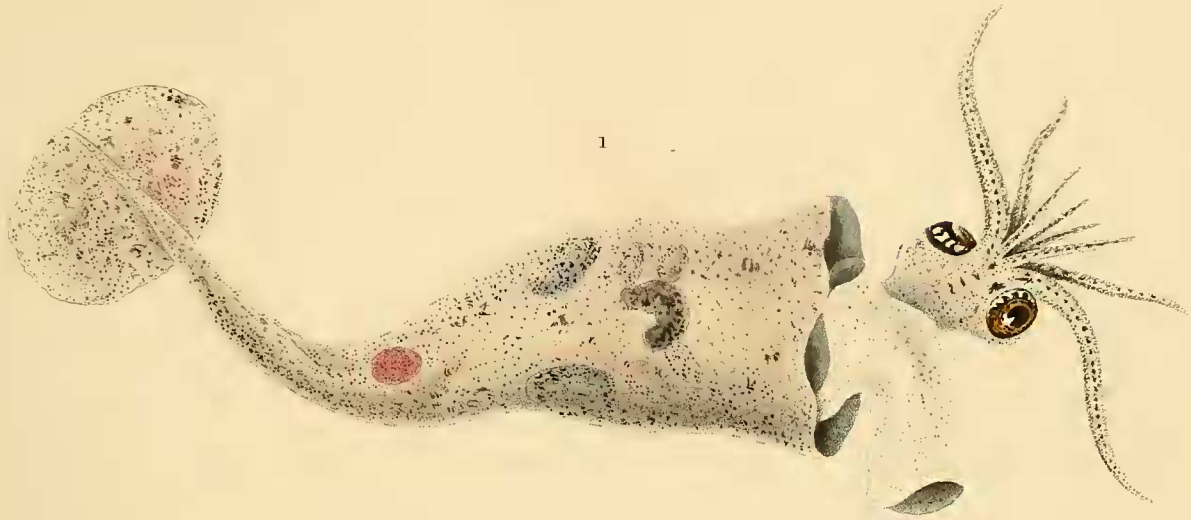
This species of *Pholas*, of which several specimens were collected, is chiefly interesting from the circumstance of its inhabiting a river, in a situation where the water was not brackish.

# I N D E X.

	Page.		Page.
AMPHIDESMA exarata (TAB. XXIV. Fig. 9) . . . . .	81	Cardita ferruginosa (TAB. XXI. Fig. 21) . . . . .	76
— simplex (TAB. XXIV. Fig. 11) . . . . .	81	Cardium Adamsii (TAB. XXII. Fig. 2) . . . . .	77
Ancillaria obtusa (TAB. XIII. Fig. 6 a, b) . . . . .	31	— aurantiacum (TAB. XXII. Fig. 4) . . . . .	77
Aplysia fimbriata (TAB. XVII. Fig. 2) . . . . .	63	— Bechei (TAB. XXII. Fig. 12) . . . . .	78
— lineolata (TAB. XVII. Fig. 1) . . . . .	63	— Kalamantanum (TAB. XXII. Fig. 7) . . . . .	77
— nodifera (TAB. XVIII. Fig. 7) . . . . .	64	— modestum (TAB. XXII. Fig. 6) . . . . .	77
— oculifera (TAB. XVII. Fig. 3) . . . . .	64	— speciosum (TAB. XXII. Fig. 9) . . . . .	77
Argonauta gondola (TAB. I. Fig. 2 a to 2 p; TAB. II. Fig. 2 q to 2 t) . . . . .	3	Carinaria Atlantica (TAB. XIII. Fig. 12) . . . . .	63
— hians (TAB. III. Fig. 2 a) . . . . .	4	Ceratosoma cornigerum (TAB. XIX. Fig. 5) . . . . .	68
— Owenii (TAB. III. Fig. 1 a, b, c, d) . . . . .	4	Cerithium articulatum (TAB. X. Fig. 14) . . . . .	43
Artemis Dunkeri (TAB. XXI. Fig. 17) . . . . .	78	— longicaudatum (TAB. X. Fig. 15) . . . . .	43
Auricula subula (TAB. XIV. Fig. 15) . . . . .	55	— obtusum (TAB. XIII. Fig. 3 a, b) . . . . .	43
Bornella Adamsii (TAB. XIX. Fig. 3) . . . . .	67	Chama laciniata (TAB. XXI. Fig. 20) . . . . .	75
— digitata (TAB. XIX. Fig. 1) . . . . .	67	Chemnitzia grandis (TAB. XI. Fig. 17) . . . . .	52
Buccinum albipunctatum (TAB. XI. Fig. 21) . . . . .	33	Columbella fulgurans (TAB. XVII. Fig. 8) . . . . .	34
— clathratum (TAB. XI. Fig. 12) . . . . .	32	— semipunctata (TAB. XIII. Fig. 7) . . . . .	34
— filosum (TAB. XI. Fig. 18) . . . . .	33	— tæniata (TAB. XI. Fig. 19) . . . . .	34
— hinuulus (TAB. VII. Fig. 10 a, b) . . . . .	32	Conus Borneensis (TAB. V. Fig. 8 a, b, c, d) . . . . .	18
— mitrella (TAB. XI. Fig. 13) . . . . .	32	— floridulus (TAB. V. Fig. 9 a, b) . . . . .	18
Bulimus Adamsii (TAB. XV. Fig. 1 a, b) . . . . .	58	— papillaris (TAB. V. Fig. 7 a, b) . . . . .	17
— chloris (TAB. XIV. Fig. 10) . . . . .	58	— pica (TAB. V. Fig. 10 a, b, c, d) . . . . .	18
— citrinus (TAB. XIV. Fig. 11) . . . . .	58	— pigmentatus (TAB. V. Fig. 11 a, b) . . . . .	18
— gregarius (TAB. XIV. Fig. 4) . . . . .	58	Corbula variegata (TAB. XXIII. Fig. 14) . . . . .	83
— Meiacoshimensis (TAB. XIV. Fig. 5) . . . . .	58	— ventricosa (TAB. XXIII. Fig. 12) . . . . .	83
Bulla Coreanica (TAB. XVIII. Fig. 3) . . . . .	65	Crassatella compressa (TAB. XXIII. Fig. 10) . . . . .	82
— soluta (TAB. XVIII. Fig. 2) . . . . .	65	— corrugata (TAB. XXIII. Fig. 7) . . . . .	82
— vexillum (TAB. XIX. Fig. 4) . . . . .	65	— nana (TAB. XXIII. Fig. 2) . . . . .	81
— Voluta (TAB. XVIII. Fig. 5) . . . . .	66	— pallida (TAB. XXIII. Fig. 9) . . . . .	82
Calyptrea cancellata (TAB. XI. Fig. 4) . . . . .	70	— picta (TAB. XXIII. Fig. 6) . . . . .	82
— depressa (TAB. XI. Fig. 2 a, b) . . . . .	70	Cyclostoma keve (TAB. XIV. Fig. 3) . . . . .	57
— plana (TAB. XI. Fig. 3) . . . . .	70	— reticulatum (TAB. XIV. Fig. 8 a, b) . . . . .	57
— trigonalis (TAB. IX. Fig. 7 a, b) . . . . .	70	— spiracellum (TAB. XIV. Fig. 1) . . . . .	56
Cancellaria lyrata (TAB. X. Fig. 4) . . . . .	42	— tenebricosum (TAB. XIV. Fig. 6 a, b) . . . . .	57
— macrospira (TAB. X. Fig. 2) . . . . .	41	Cyllene lugubris (TAB. X. Fig. 10) . . . . .	33
— pyrum (TAB. X. Fig. 16) . . . . .	42	— pulchella (TAB. X. Fig. 11) . . . . .	33
— semipellucida (TAB. X. Fig. 3, 3 a) . . . . .	42	Cypræa (TAB. V. Fig. 4 a, b, c, 5, 6) . . . . .	23
		Cyrenoida alata (TAB. XXIV. Fig. 12) . . . . .	80

	Page		Page
Cyrenoida Coreensis (TAB. XXIV. Fig. 14) . . . . .	80	Isocardia tetragona (TAB. XXII. Fig. 1) . . . . .	76
Cytherca virginea (TAB. XXIV. Fig. 10) . . . . .	78	Lima Basilanica (TAB. XXI. Fig. 6) . . . . .	75
Delphinula stellaris (TAB. XI. Fig. 7) . . . . .	51	— orientalis (TAB. XXI. Fig. 7) . . . . .	75
Dentalium formosum (TAB. V. Fig. 1 a, b) . . . . .	71	Littorina castanca (TAB. XI. Fig. 8) . . . . .	49
Dolabella Rumphii (TAB. XVIII. Fig. 4) . . . . .	65	Loligopsis ellipsoptera (TAB. I. Fig. 1) . . . . .	2
Eburna areolata (TAB. VIII. Fig. 5) . . . . .	32	Lucina fibula (TAB. XXIV. Fig. 5) . . . . .	80
Eglisia tricarinata (TAB. XII. Fig. 8) . . . . .	49	— sericata (TAB. XXIV. Fig. 6) . . . . .	80
Emargiuula clathrata (TAB. XI. Fig. 6) . . . . .	69	Lyonsia uavicula (TAB. XXIII. Fig. 11) . . . . .	83
Erato callosa (TAB. X. Fig. 32 a, b) . . . . .	25	Maetra Thracioides (TAB. XXIII. Fig. 8) . . . . .	81
Eulima bilineata (TAB. XI. Fig. 24) . . . . .	52	Mangelia trivittata (TAB. X. Fig. 9) . . . . .	41
— Mindorensis (TAB. XI. Fig. 25) . . . . .	52	Margarita bicarinata (TAB. XI. Fig. 11 a, b) . . . . .	49
— solidula (TAB. XI. Fig. 27) . . . . .	53	Marginella diadochus (TAB. VII. Fig. 4 a, b, c) . . . . .	28
— tortuosa (TAB. XI. Fig. 26) . . . . .	53	— onychina (TAB. X. Fig. 25) . . . . .	29
— unilineata (TAB. XI. Fig. 23) . . . . .	52	— undulata (TAB. VII. Fig. 5 a, b, c) . . . . .	29
Ficula laevigata (TAB. IX. Fig. 4) . . . . .	39	Melampus leucodon (TAB. XIV. Fig. 17) . . . . .	55
— reticulata (TAB. IX. Fig. 5) . . . . .	39	Mitra dichroa (TAB. X. Fig. 29) . . . . .	27
Fissurella excelsa (TAB. XI. Fig. 5) . . . . .	70	— incisa (TAB. X. Fig. 31) . . . . .	27
Fusus acus (TAB. VII. Fig. 3 a, b) . . . . .	41	— rubella (TAB. X. Fig. 30) . . . . .	27
— gracillimus (TAB. VII. Fig. 1) . . . . .	41	— rufilirata (TAB. X. Fig. 26) . . . . .	26
— spectrum (TAB. VII. Fig. 2) . . . . .	41	— semisculpta (TAB. X. Fig. 28) . . . . .	27
Goniodoris trilincata (TAB. XVII. Fig. 4, 4 a) . . . . .	68	— Suluensis (TAB. X. Fig. 27) . . . . .	26
— Whitei (TAB. XIX. Fig. 6) . . . . .	68	Murex Burnettii (TAB. VIII. Fig. 4 a, b) . . . . .	38
Haliotis venusta (TAB. XIII. Fig. 5 a, b) . . . . .	69	— eurypteron (TAB. VIII. Fig. 1 a, b) . . . . .	38
Helix antiqua (TAB. XVI. Fig. 1) . . . . .	61	— plorator (TAB. VIII. Fig. 3 a, b) . . . . .	38
— Batanica (TAB. XV. Fig. 5 a, b) . . . . .	60	— ronifluus (TAB. VIII. Fig. 2 a, b) . . . . .	38
— Brookei (TAB. XV. Fig. 4 a, b) . . . . .	60	Mya Mindorensis (TAB. XXIII. Fig. 13) . . . . .	82
— caliginosa (TAB. XVI. Fig. 6) . . . . .	62	Natica macrotremis (TAB. XIII. Fig. 9) . . . . .	54
— calliostoma (TAB. XIV. Fig. 7 a, b) . . . . .	59	Ncera Molucaua (TAB. XXIII. Fig. 4) . . . . .	84
— canescens (TAB. XVI. Fig. 10) . . . . .	62	Nucula Japonica (TAB. XXI. Fig. 9) . . . . .	75
— conoidalis (TAB. XVI. Fig. 11) . . . . .	63	— mirabilis (TAB. XXI. Fig. 8) . . . . .	75
— Coreanica (TAB. XVI. Fig. 2) . . . . .	61	Oliva fulgurata (TAB. X. Fig. 12) . . . . .	31
— curvilabrum (TAB. XIV. Fig. 9 a, b) . . . . .	59	Oniscia exquisita (TAB. V. Fig. 3 a, b) . . . . .	35
— decora (TAB. XVI. Fig. 7) . . . . .	62	Ostræa pyxidata (TAB. XXI. Fig. 19) . . . . .	72
— densa (TAB. XVI. Fig. 8) . . . . .	62	Ovulum acumiatum (TAB. VI. Fig. 1 a, b) . . . . .	21
— immaculata (TAB. XVI. Fig. 5) . . . . .	62	— bulla (TAB. VI. Fig. 5 a, b) . . . . .	21
— leucostoma (TAB. XVI. Fig. 3) . . . . .	61	— bullatum (TAB. VI. Fig. 13 a, b) . . . . .	23
— Mackensii (TAB. XV. Fig. 6 a, b) . . . . .	60	— coarctatum (TAB. VI. Fig. 2 a, b) . . . . .	21
— obscurata (TAB. XIV. Fig. 18) . . . . .	59	— concinnum (TAB. VI. Fig. 8 a, b, c) . . . . .	22
— orientalis (TAB. XVI. Fig. 4) . . . . .	61	— dentatum (TAB. VI. Fig. 4 a, b) . . . . .	21
— plurizonata (TAB. XVI. Fig. 9) . . . . .	62	— formosum (TAB. VI. Fig. 6 a, b) . . . . .	22
— Tayloriaua (TAB. XV. Fig. 2 a, b) . . . . .	59	— gracile (TAB. VI. Fig. 11 a, b, c) . . . . .	22
— tropidophora (TAB. XIV. Fig. 14) . . . . .	59	— nubeculatum (TAB. VI. Fig. 12 a, b, c) . . . . .	23
— Typinsana (TAB. XV. Fig. 3 a, b) . . . . .	60	— recurvum (TAB. VI. Fig. 3 a, b, c) . . . . .	21
— vittata (TAB. XV. Fig. 7 a, b, c) . . . . .	60	— subreflexum (TAB. VI. Fig. 10 a, b) . . . . .	22
Hemipecten Forbesiauis (TAB. XX.) . . . . .	73	— verrucosum (TAB. VI. Fig. 7) . . . . .	20
Hippagus novemcostatus (TAB. XXIV. Fig. 1) . . . . .	76	— volva (TAB. VI. Fig. 9) . . . . .	19
Ianthina planispirata (TAB. XI. Fig. 10) . . . . .	54	Pecten asperulatus (TAB. XXI. Fig. 13) . . . . .	74
— striolata (TAB. XI. Fig. 9) . . . . .	54	— aurantiacus (TAB. XXI. Fig. 12) . . . . .	74
Isocardia Moltkiana (TAB. XXII. Fig. 3) . . . . .	77	— cristularis (TAB. XXI. Fig. 15) . . . . .	74

	Page.		Page.
Pecten denticulatus (TAB. XXI. Fig. 14) . . . . .	74	Stylifer Astericola (TAB. XVII. Fig. 5) . . . . .	47
— fulvicostatus (TAB. XXI. Fig. 11) . . . . .	74	Terebra albicostata (TAB. X. Fig. 21) . . . . .	30
— Reevei (TAB. XXI. Fig. 10 <i>a, b</i> ) . . . . .	73	— areolata (TAB. X. Fig. 23) . . . . .	30
Pectunculus aspersus (TAB. XXII. Fig. 8) . . . . .	76	— cælata (TAB. X. Fig. 22) . . . . .	30
— Belcheri (TAB. XXII. Fig. 5) . . . . .	76	— roseata (TAB. X. Fig. 24) . . . . .	30
Pholas rivicola (TAB. XXIII. Fig. 5) . . . . .	84	— serotina (TAB. X. Fig. 20) . . . . .	30
Phorus exutus (TAB. XVII. Fig. 7) . . . . .	50	— torquata (TAB. X. Fig. 13) . . . . .	30
— Solarioides (TAB. XVII. Fig. 6) . . . . .	50	Terebellum subulatum (TAB. IX. Fig. 6) . . . . .	36
Pileopsis astericola (TAB. XI. Fig. 1) . . . . .	69	Terebratula abyssicola (TAB. XXI. Fig. 5) . . . . .	72
Pleurobranchus luniceps (TAB. XVIII. Fig. 6 <i>a, b</i> ) . . . . .	66	— angusta (TAB. XXI. Fig. 2) . . . . .	71
Pleurotoma albicincta (TAB. X. Fig. 6) . . . . .	40	— Capensis (TAB. XXI. Fig. 4) . . . . .	71
— Coreanica (TAB. X. Fig. 8) . . . . .	40	— Coreanica (TAB. XXI. Fig. 3) . . . . .	71
— fagina (TAB. IX. Fig. 2 <i>a, b</i> ) . . . . .	40	— Japonica (TAB. XXI. Fig. 1) . . . . .	71
— Griffithii (TAB. XIII. Fig. 13) . . . . .	40	Thracia granulosa (TAB. XXIII. Fig. 16) . . . . .	82
— impages (TAB. IX. Fig. 1 <i>a, b</i> ) . . . . .	39	— trigonalis (TAB. XXIV. Fig. 8) . . . . .	83
— leucotropis (TAB. X. Fig. 7) . . . . .	40	Triphoris alveolatus (TAB. XI. Fig. 30 <i>a, b</i> ) . . . . .	45
— lurida (TAB. X. Fig. 5) . . . . .	40	— dextroversus (TAB. XI. Fig. 31 <i>a, b</i> ) . . . . .	45
Poromya nitida (TAB. XXIII. Fig. 3) . . . . .	83	— gemmulatus (TAB. XI. Fig. 34 <i>a, b</i> ) . . . . .	46
— pulchella (TAB. XXIII. Fig. 1) . . . . .	83	— granulatus (TAB. XI. Fig. 33 <i>a, b</i> ) . . . . .	46
Psammobia denticulata (TAB. XXIV. Fig. 2) . . . . .	80	— nodiferus (TAB. XI. Fig. 37 <i>a, b</i> ) . . . . .	46
— flexuosa (TAB. XXIV. Fig. 3) . . . . .	80	— pyramidalis (TAB. XI. Fig. 36 <i>a, b</i> ) . . . . .	46
— rugulosa (TAB. XXIV. Fig. 4 <i>a, b</i> ) . . . . .	81	— speciosus (TAB. XI. Fig. 28 <i>a, b</i> ) . . . . .	45
Pupina Mindorensis (TAB. XIV. Fig. 2) . . . . .	57	— suturalis (TAB. XI. Fig. 29 <i>a, b</i> ) . . . . .	45
Purpura cuspidata (TAB. XI. Fig. 35) . . . . .	33	— verrucosus (TAB. XI. Fig. 32 <i>a, b</i> ) . . . . .	45
Pyramidella magnifica (TAB. X. Fig. 1) . . . . .	53	Triton monilifer (TAB. X. Fig. 18) . . . . .	37
Ranella albiviridosa (TAB. XIII. Fig. 4) . . . . .	37	— pyrulum (TAB. X. Fig. 17) . . . . .	37
Rissoa insignis (TAB. XI. Fig. 20) . . . . .	53	— testudinarius (TAB. IX. Fig. 3 <i>a, b</i> ) . . . . .	37
Rostellaria rectirostris (TAB. V. Fig. 2 <i>a, b, c</i> ) . . . . .	35	Turbiuella Belcheri (TAB. VII. Fig. 7 <i>a, b</i> ) . . . . .	42
Rtella conica (TAB. XI. Fig. 22 <i>a, b</i> ) . . . . .	49	— lauceolata (TAB. VII. Fig. 8) . . . . .	42
Scalaria eximia (TAB. XI. Fig. 16) . . . . .	51	— picta (TAB. VII. Fig. 9) . . . . .	43
— maculosa (TAB. XI. Fig. 14) . . . . .	51	Turritella bicolor (TAB. XII. Fig. 1) . . . . .	47
— neglecta (TAB. XI. Fig. 15) . . . . .	51	— canaliculata (TAB. XII. Fig. 11) . . . . .	49
Scarabus Cumingianus (TAB. XIV. Fig. 16) . . . . .	56	— congelata (TAB. XII. Fig. 2) . . . . .	47
— imbrium (TAB. XIV. Fig. 13) . . . . .	56	— conspersa (TAB. XII. Fig. 3) . . . . .	47
— trigonus (TAB. XIV. Fig. 12) . . . . .	56	— declivis (TAB. XII. Fig. 10) . . . . .	48
Scyllæa Grayæ (TAB. XIX. Fig. 2) . . . . .	67	— fastigiata (TAB. XII. Fig. 9) . . . . .	48
Sigaretus acuminatus (TAB. XIII. Fig. 8) . . . . .	54	— monilifera (TAB. XII. Fig. 6) . . . . .	48
— inculptus (TAB. XIII. Fig. 10) . . . . .	55	— multilirata (TAB. XII. Fig. 4) . . . . .	48
— latifasciatus (TAB. XIII. Fig. 11) . . . . .	55	— opalina (TAB. XII. Fig. 7) . . . . .	48
Siphonaria Coreensis (TAB. XIII. Fig. 1 <i>a, b</i> ) . . . . .	69	— vittulata (TAB. XII. Fig. 5) . . . . .	48
— radiata (TAB. XIII. Fig. 2 <i>a, b</i> ) . . . . .	69	Venus costellifera (TAB. XXI. Fig. 18) . . . . .	79
Siphonotus geographicus (TAB. XVIII. Fig. 1) . . . . .	64	— elegans (TAB. XXIV. Fig. 13) . . . . .	79
Solen albida (TAB. XXIII. Fig. 15) . . . . .	84	— Labuana (TAB. XXI. Fig. 16) . . . . .	79
Spirula australis (TAB. IV. Fig. 2, 8) . . . . .	6	— quadrangularis (TAB. XXIV. Fig. 7) . . . . .	79
— Peronii (TAB. IV. Fig. 1, 1*, 4-7, 11, 15) . . . . .	6	— Philippiarum (TAB. XXII. Fig. 10) . . . . .	79
— reticulata (TAB. IV. Fig. 3, 9, 10) . . . . .	6	— tessellata (TAB. XXII. Fig. 11) . . . . .	79
Strombus corrugatus (TAB. X. Fig. 19) . . . . .	35	Voluta abyssicola (TAB. VII. Fig. 6 <i>a, b, c, d</i> ) . . . . .	25



1



2c



2d



2e



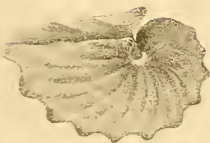
2f



2g



2h



2i



2k



2l



2m



2n



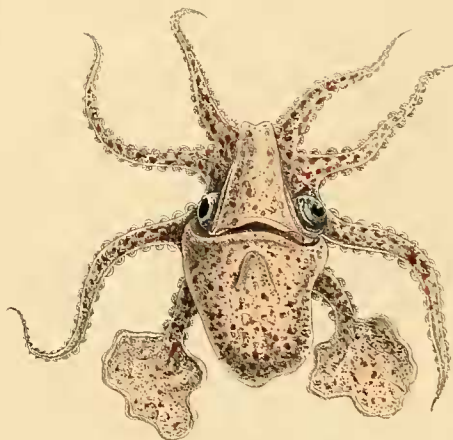
2o



2p



2a

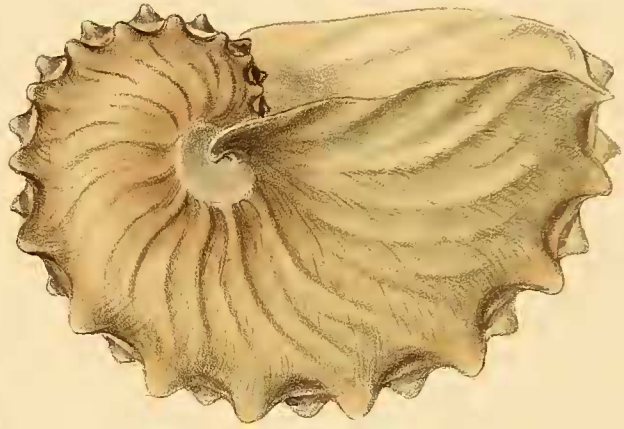


2b





2.9.



2.8.



2.7.



2.7.



1. a.



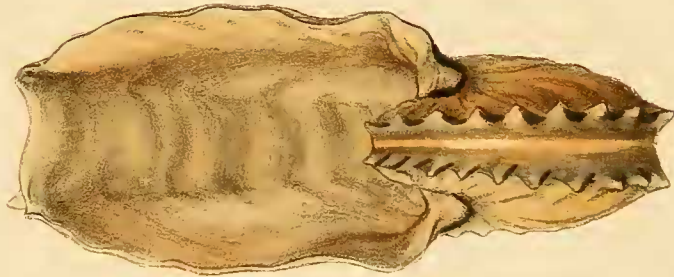
1. b.



1. c.



1. d.



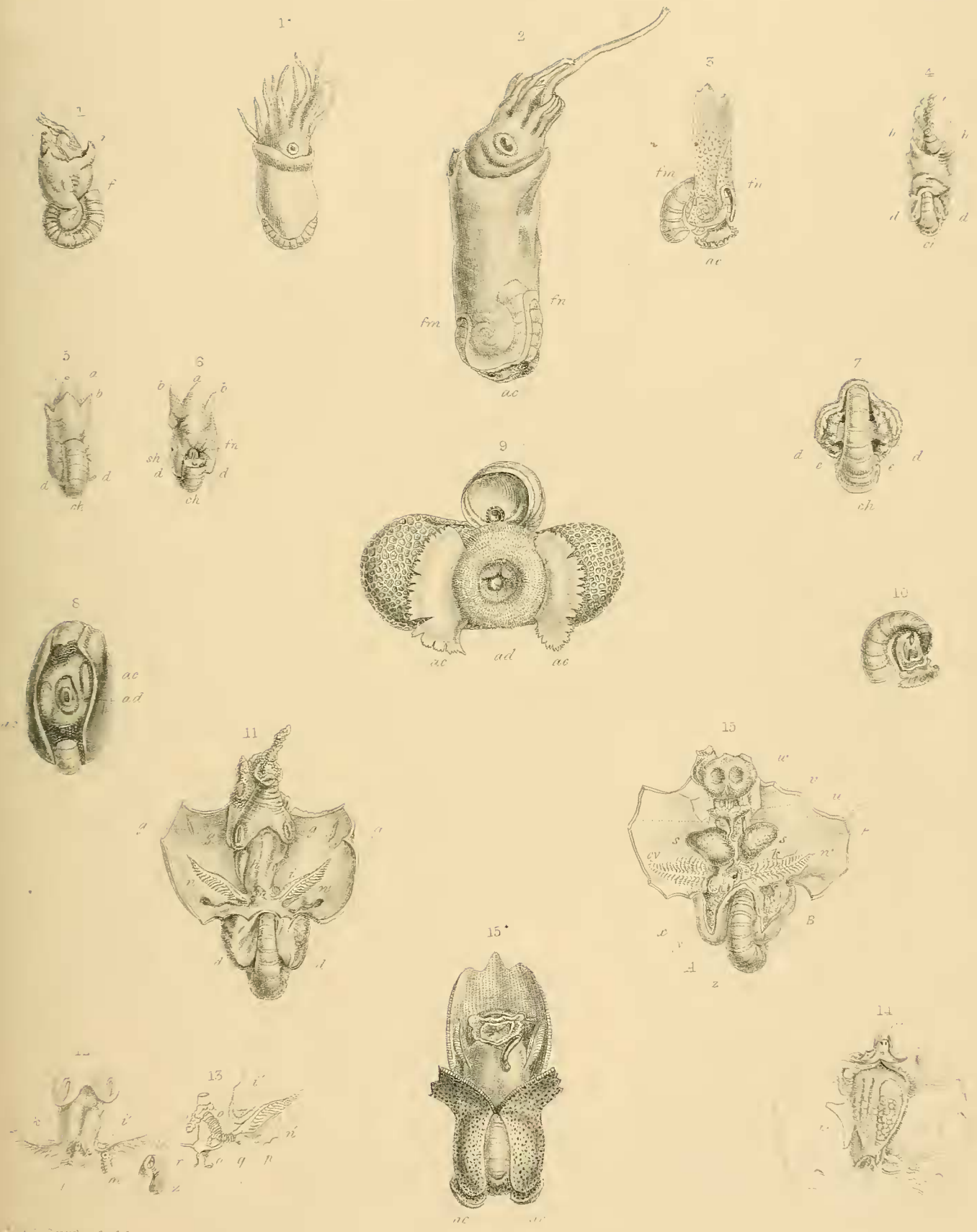
2. a.



2. b.



2. c.



C. D. Cowerby sculpt.



1a.



1b.



2a.



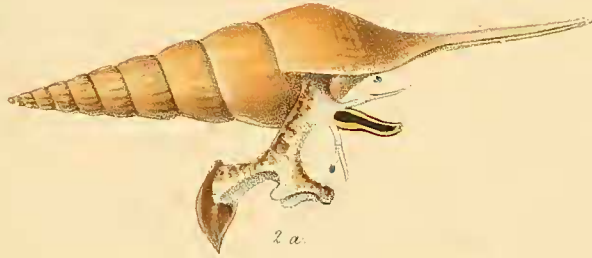
2b.



3a.



3b.



2a.



8a.



8b.



7a.



7b.



4b.



4c.



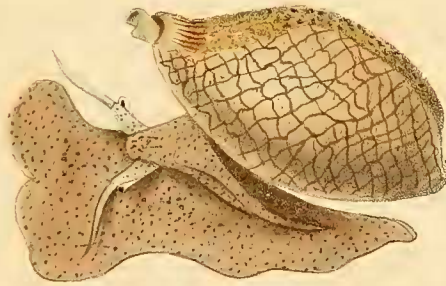
4a.



8c.



8d.



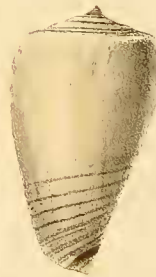
5.



9a.



9b.



10a.



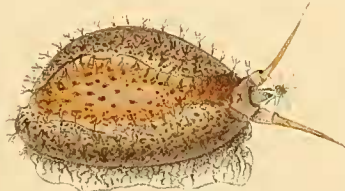
10b.



11a.



11b.



6.

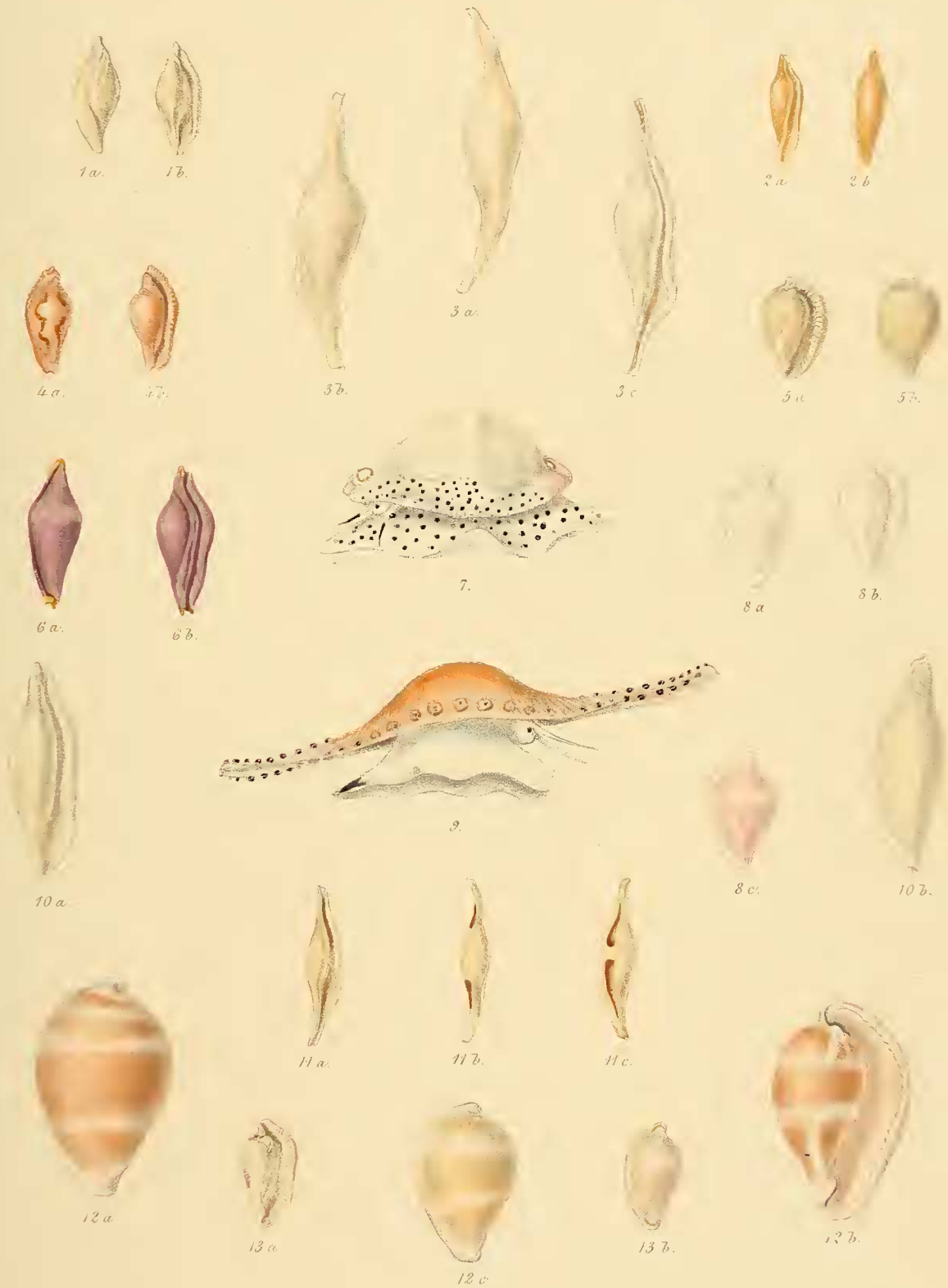


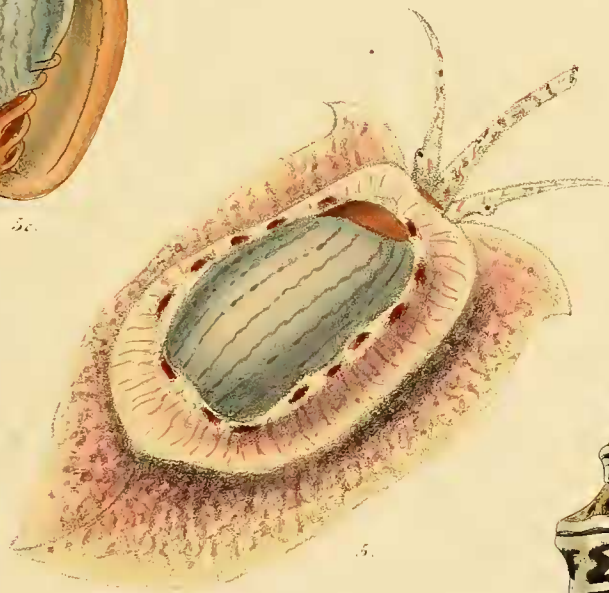
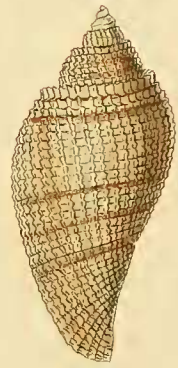
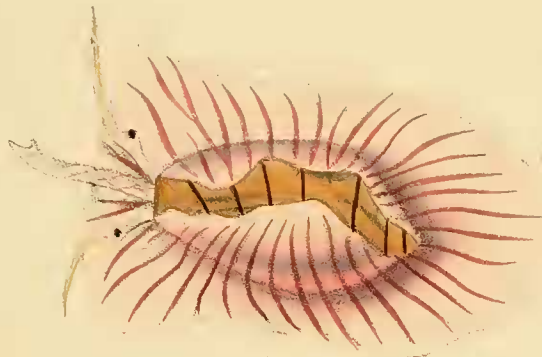
10c.



10d.

MOLLUSCA





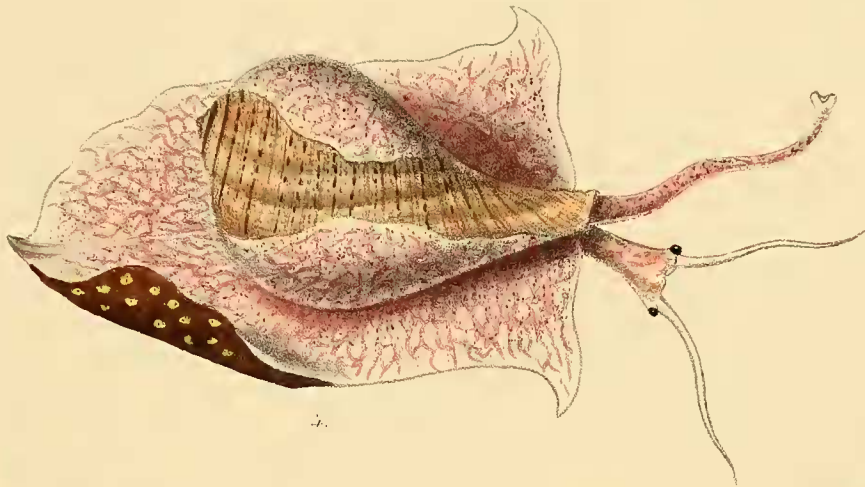
*Text in a small box, possibly a reference or note.*







1a.



4.



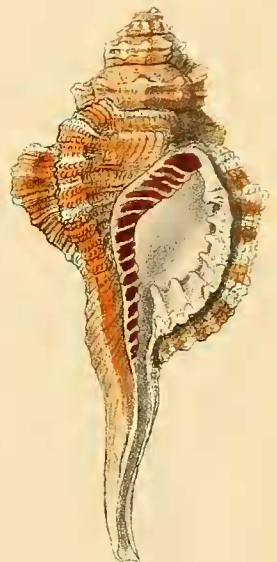
1b.



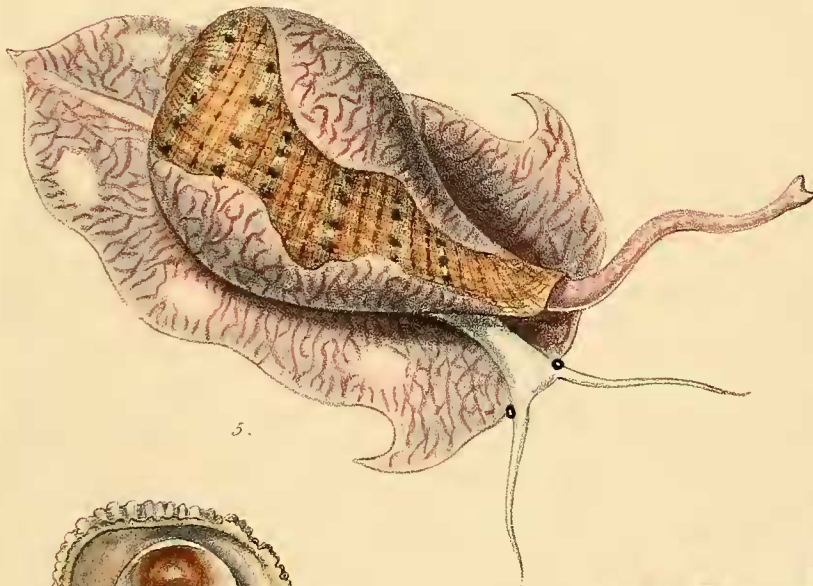
3a.



6.



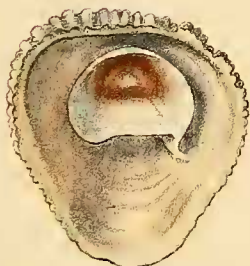
3b.



5.



2a.



7a.



7b.



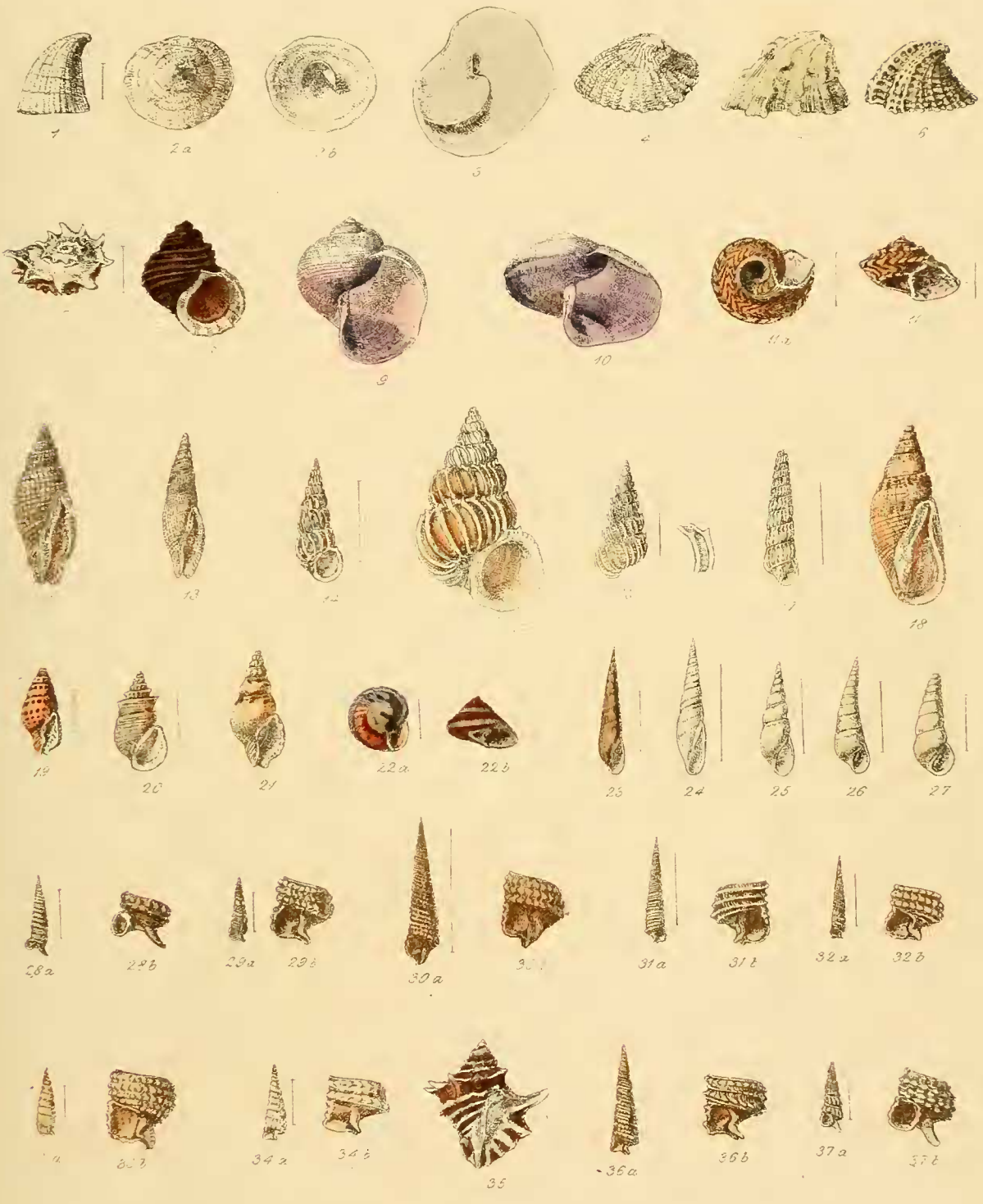
2b.

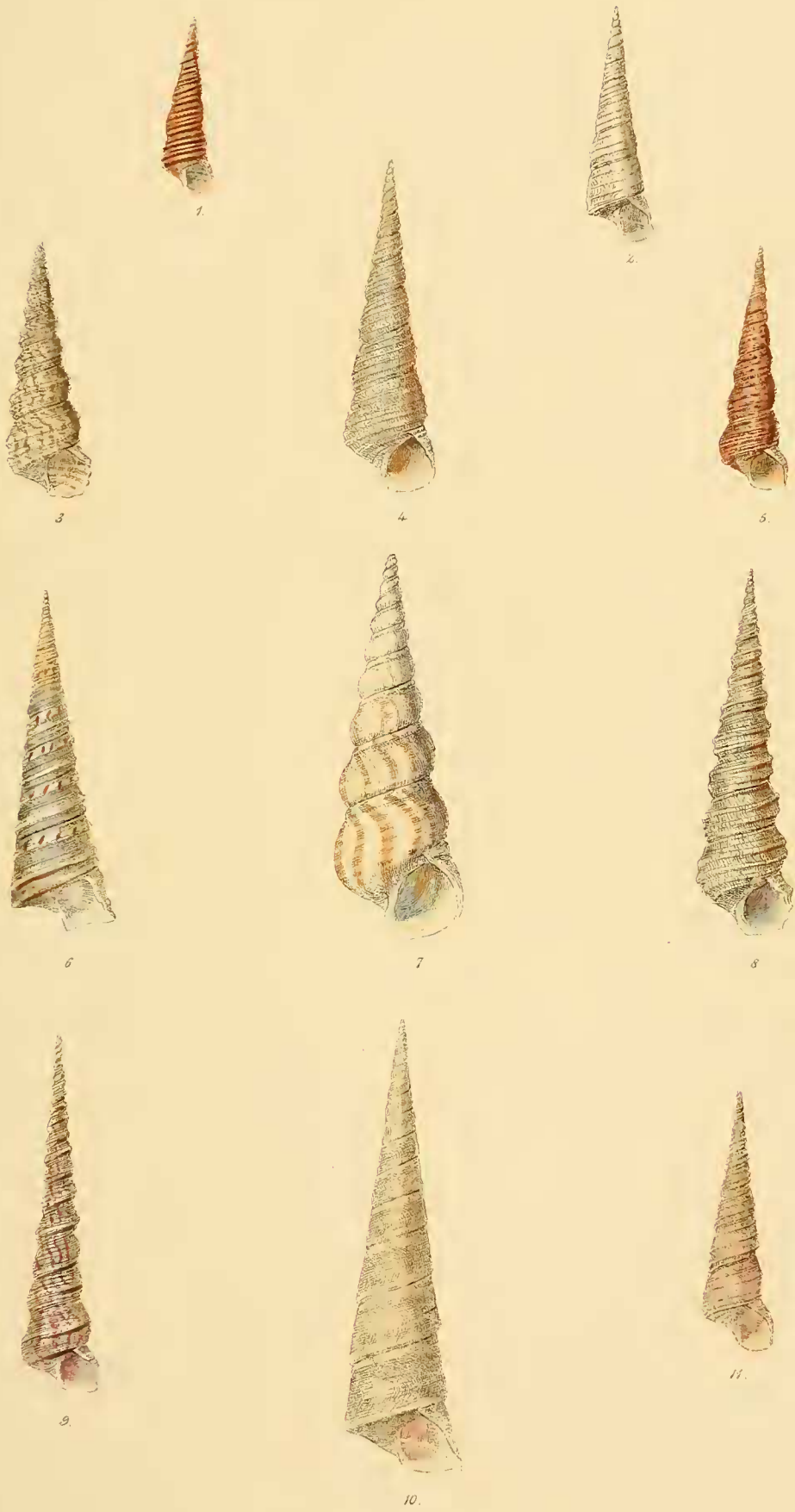


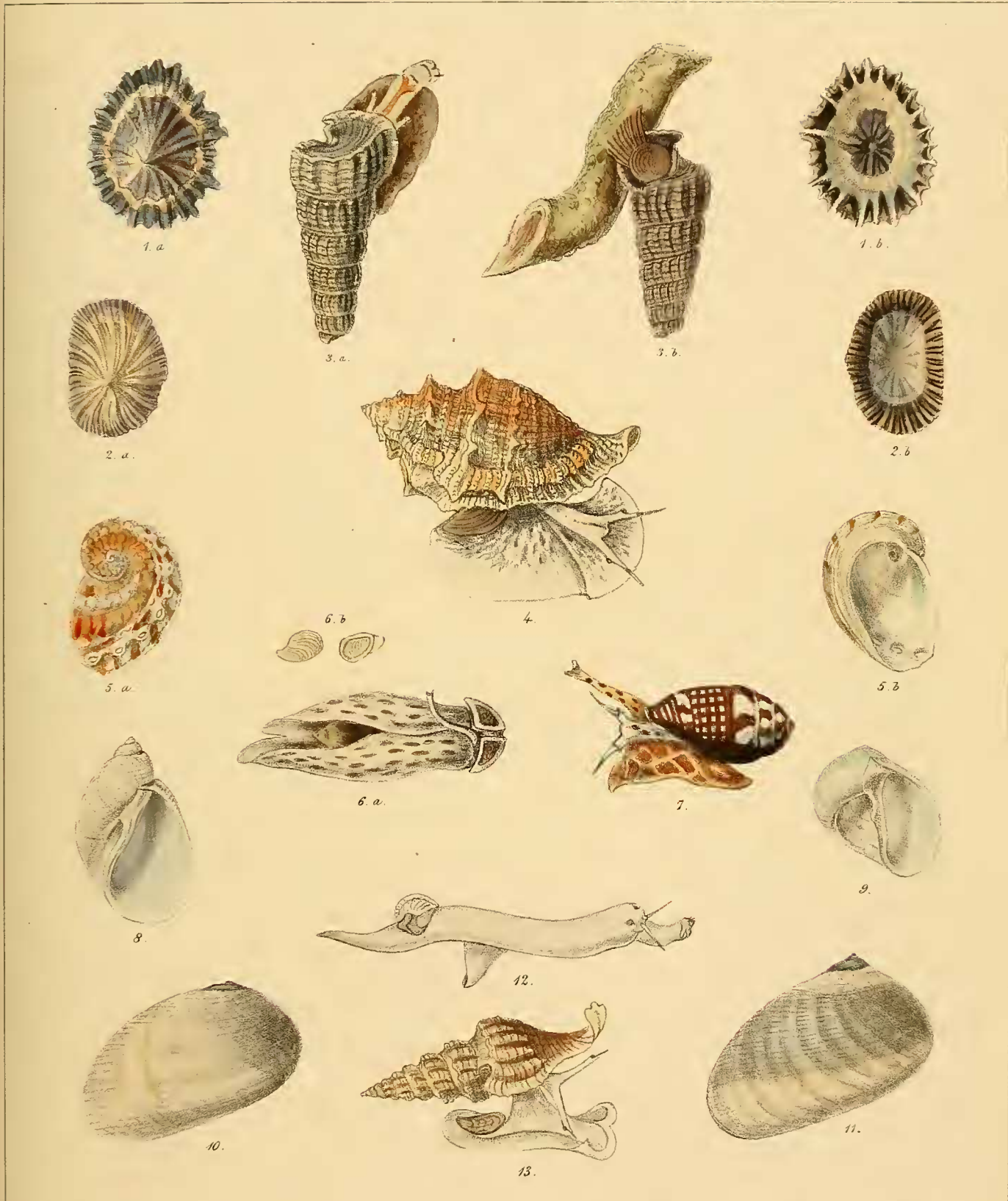
MOLLUSCA.

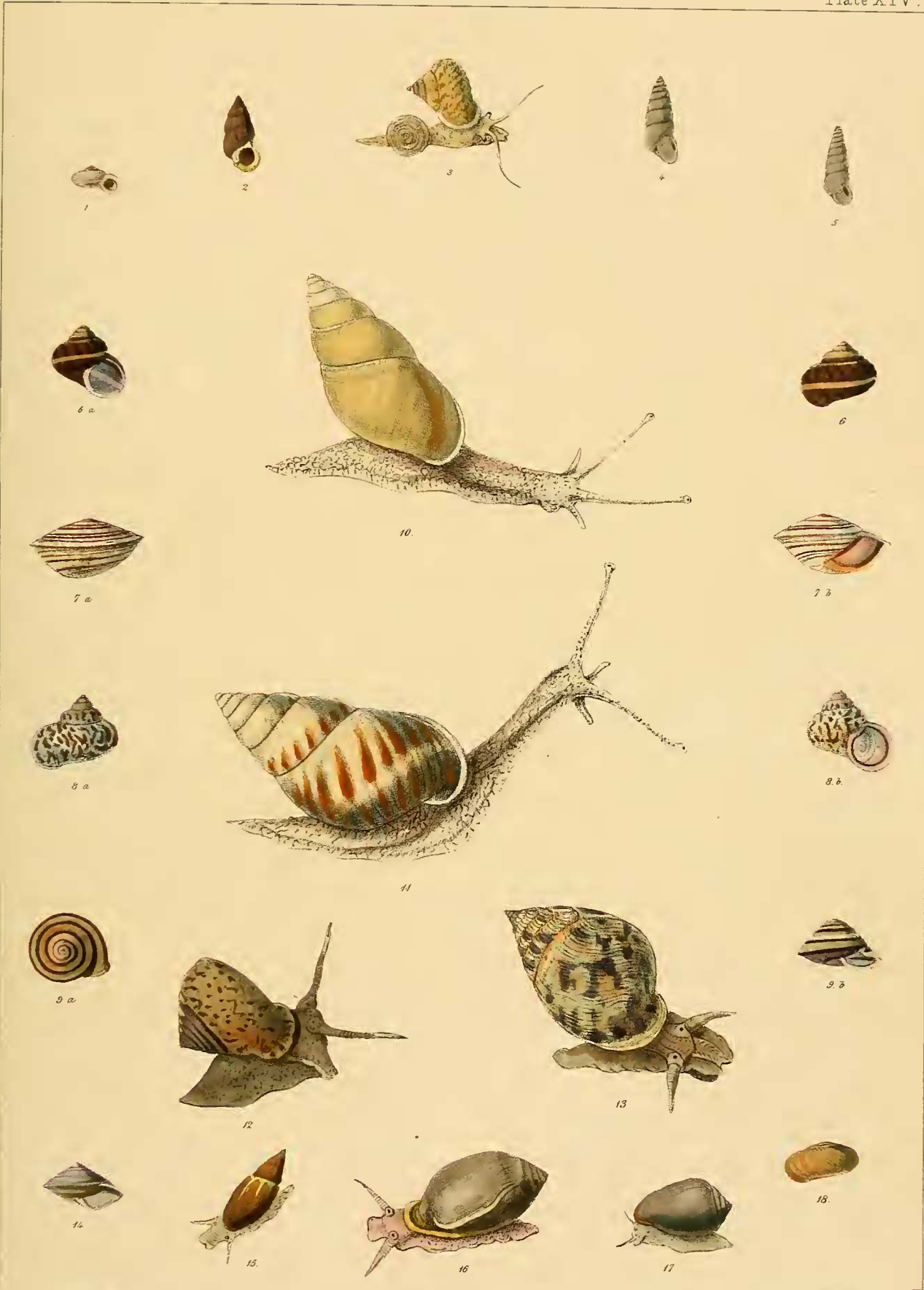


MOLLUSCA.



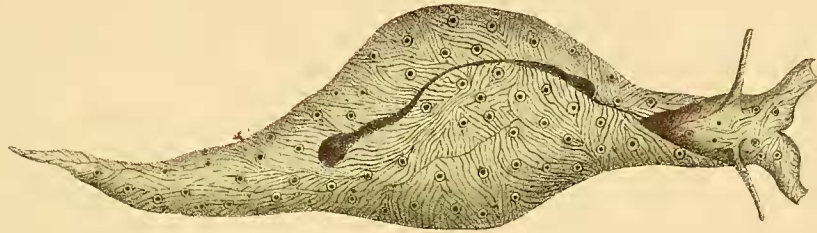












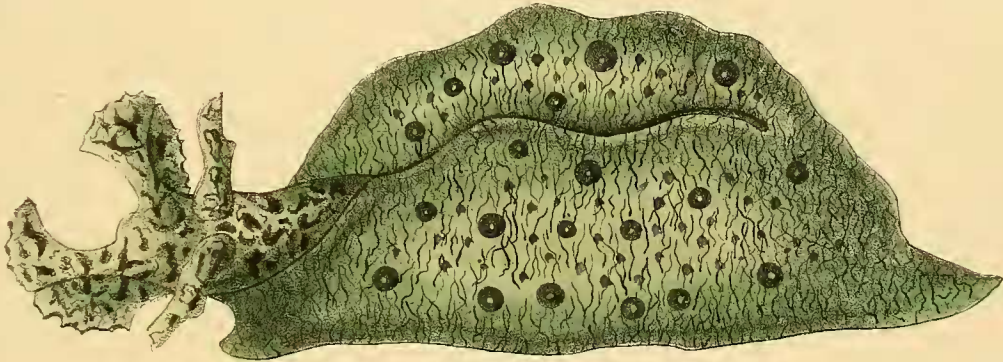
4.



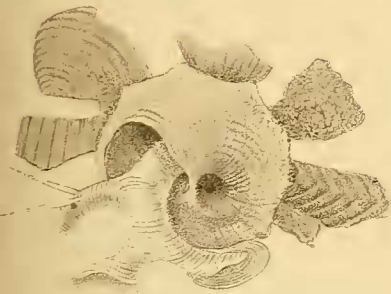
4a.



5.



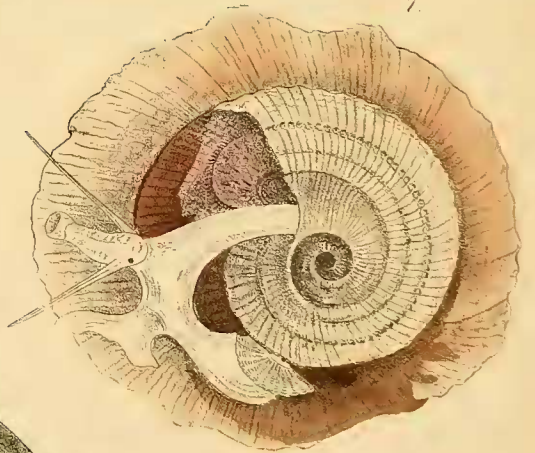
2.



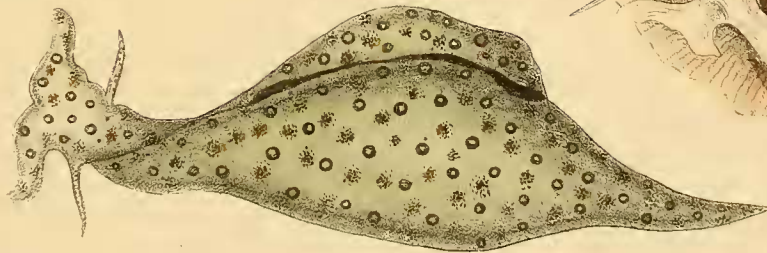
6.



8.



7.

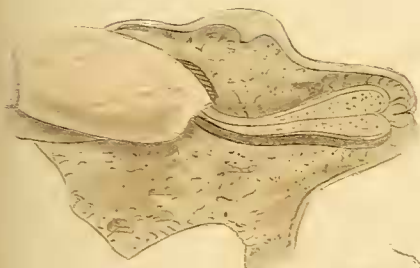


3.

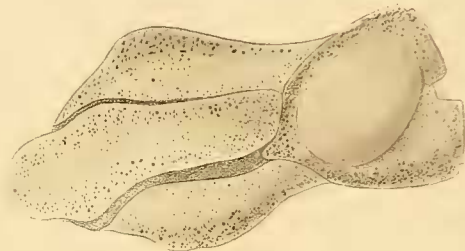




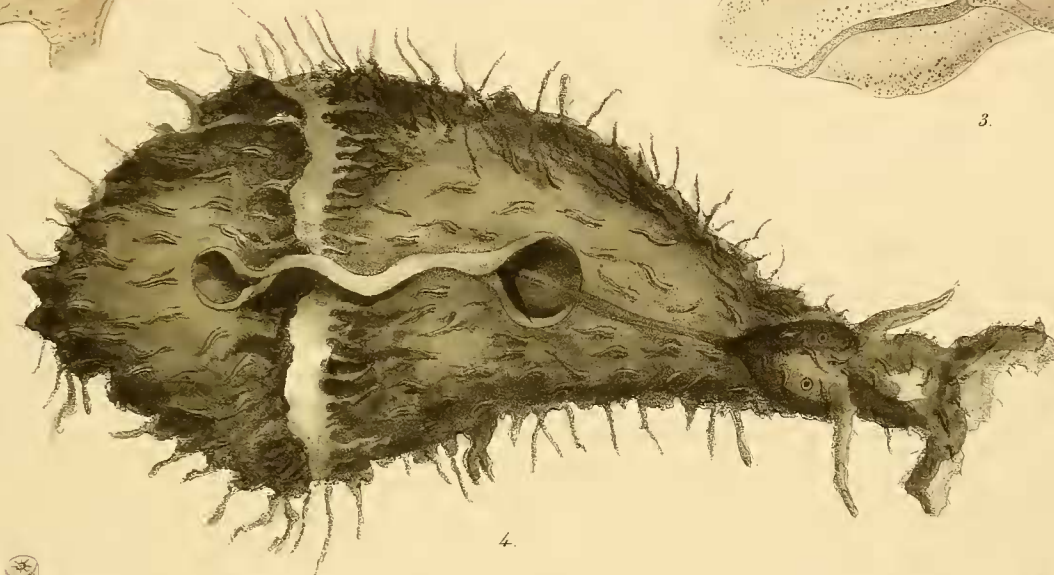
1.



2.



3.



4.



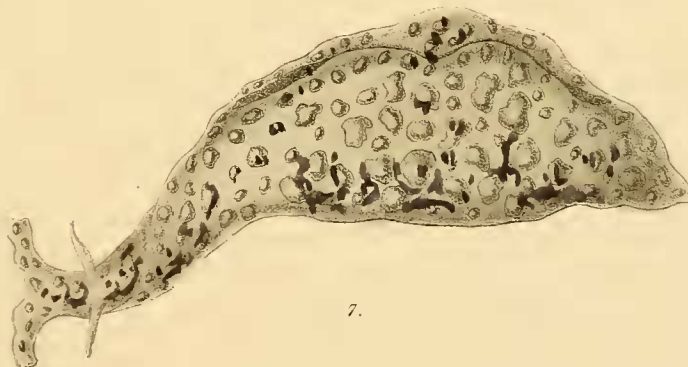
6.a.



5.



6.b.



7.



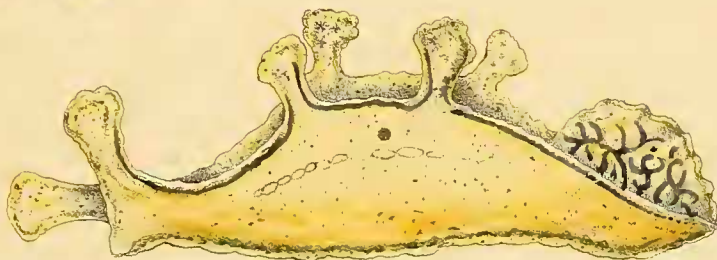
1.



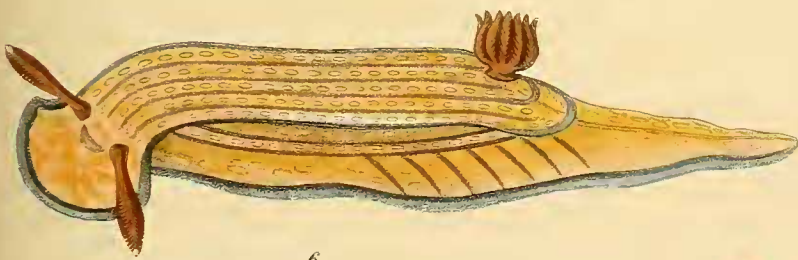
4.



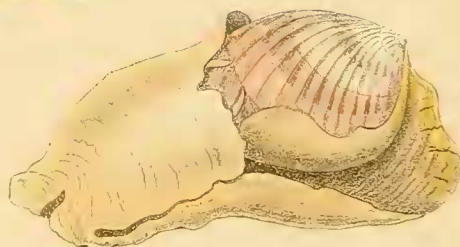
5.



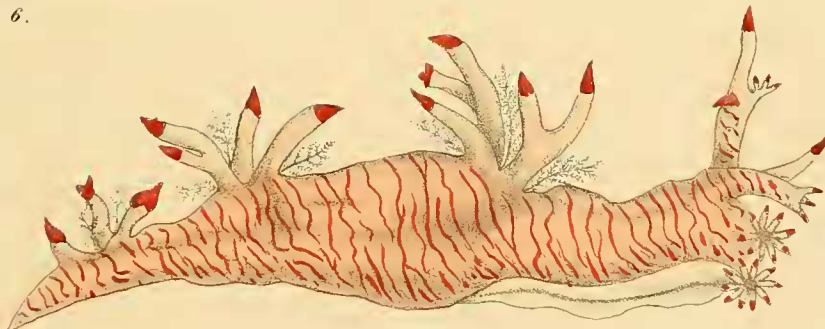
2.



6.



7.



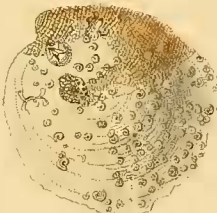
3.



1. a.



1. b.



1. c.



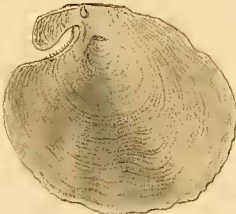
2. a.



2. b.



2. c.



2. d.

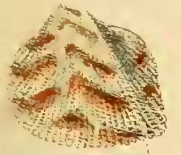




1.



3.



2.



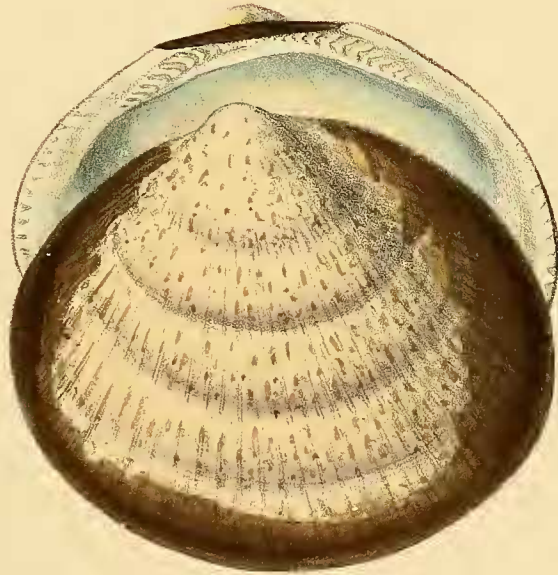
4.



6.



5.



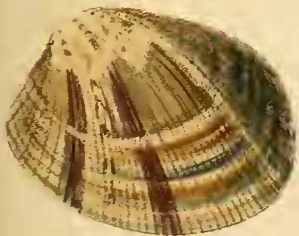
8.



9.



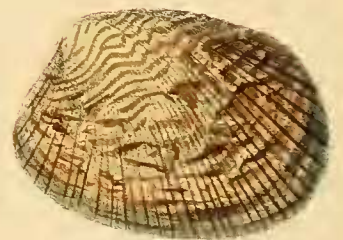
7.



10.



12.

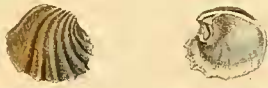


11.

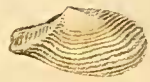




2.



1.



3.



4. a.



5.



4. b.



6.



7.



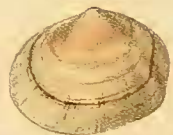
8.



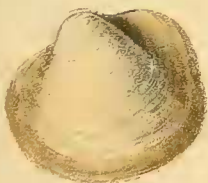
9.



10.



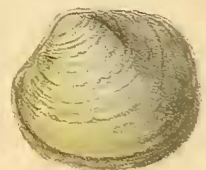
11.



12.



13.



14.